NOLOGY DEPARTMENT

THE JOURNAL OF THE INSTITUTION OF PRODUCTION ENGINEERS

VOL. XXVIII - No. 3 - March, 1949

PUBLIC LIBRARY
MAR 26 1949
DETROIT

Contents :

STEEL PRODUCTION—
SOME FACTS AND PROBLEMS
by L. CHAPMAN.

THE PRODUCTION ENGINEER IN
RELATION TO NATIONAL ECONOMY
by B. H. DYSON, M.I.P.E., F.I.I.A.

Published by THE INSTITUTION,
36, PORTMAN SQUARE, LONDON, W.1
All rights reserved.

Telephone :
WELbeck 6813/7.
PRICE 5/-

TRIEFUS

INDUSTRIAL DIAMONDS

For
Wheel dressing
Wire drawing
Drilling, engraving &
all mechanical purposes

Diamond Boart
& Diamond Powder
(Graded and Purified)

TRIEFUS & CO., LTD.

32-34 HOLBORN VIADUCT · LONDON · E.C.1
Phone: CENTRAL 9923-4 · *Grams:* TRIEFUS LONDON

NEW YORK · PARIS · TORONTO
SYDNEY · WELLINGTON
GEORGETOWN, B.G. · ANTWERP · RIO DE JANEIRO

Aluminium Alloy Sand Casting

GEARBOX FOR PASSENGER CARRYING AND COMMERCIAL VEHICLE

WEIGHT 69 lbs.

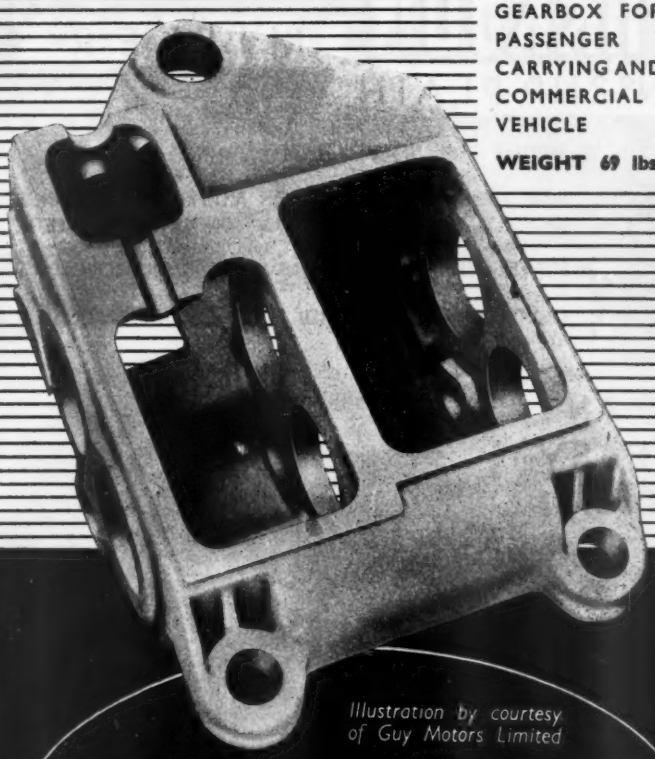


Illustration by courtesy of Guy Motors Limited

STERLING METALS LTD.

Coventry

TELEPHONE COVENTRY 89031 (6 LINES) TELEGRAMS STERMET PHONE COVENTRY

OUR ENGINEERS ARE READILY AVAILABLE FOR CONSULTATION ON NEW PRODUCTS

PARKSON MILLER

Nº 2NP PLAIN

★ SPINDLE ON TAPER ROLLER BEARINGS

★ MAIN TRANSMISSION SHAFTS ON ANTIFRICTION BEARINGS AND GEARS HARDENED AND GROUND ON TEETH

★ POWER FEED AND RAPID TRAVERSE TO ALL MOVEMENTS

★ CONTROL LEVERS REACHED FROM OPERATING POSITION AT FRONT OF KNEE

AN 'EASY' MACHINE

Specification :

Table ... 51" × 12½"

Movements 30" × 10" × 18"

12 spindle speeds 29 - 775 r.p.m.

12 feed rates ½" - 10½" per min.

Rapid Traverse 100" per min.

J. PARKINSON & SON

SHIPLEY YORKSHIRE

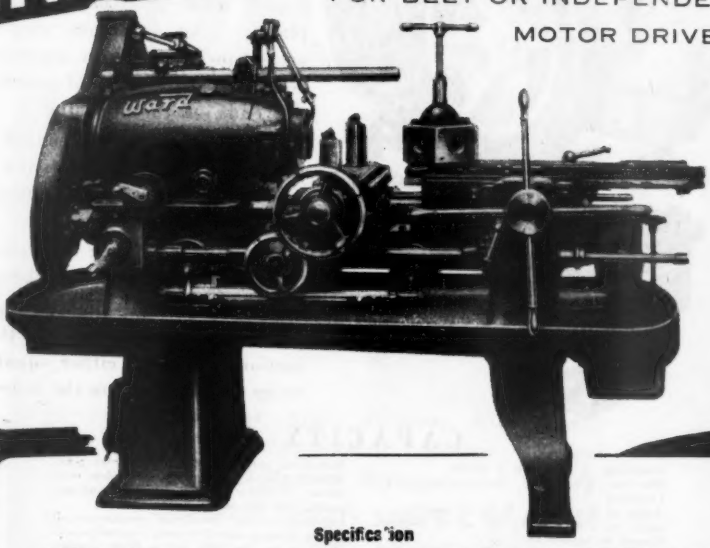
P 272

Ward

CAPSTAN & TURRET LATHES

No. 3A Capstan Lathe

FOR BELT OR INDEPENDENT MOTOR DRIVE



Specification

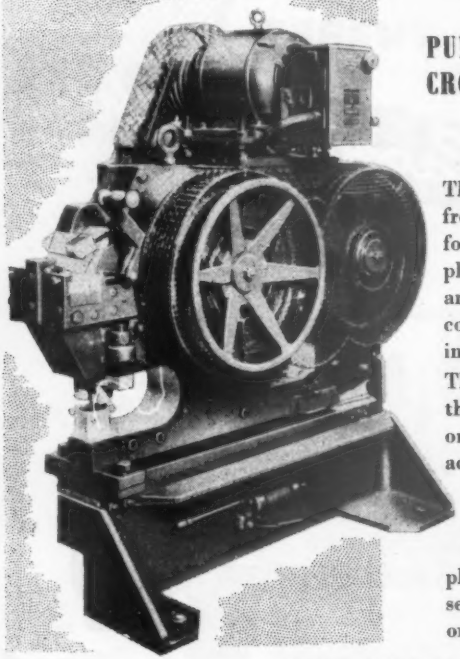
Height of centres	6¼ in.	Range of spindle speeds	42 to 1850 r.p.m.
Dia. of hole through spindle	1⅝ in.	Max. dia. that will swing over bed ...	13½ in.
Dia. that automatic chuck will take up to	1¼ in.	Swing over steel cross slide	7 in.
No. of spindle speeds forward and reverse	8		

Further details on request.

H. W. WARD & CO. LTD. Dale Road Birmingham 29

COBORN·WADLEY

combined



PUNCHING · SHEARING CROPPING AND NOTCHING MACHINE

TYPE D.E.P.S. 24

This combined unit is fabricated from 2″ mild steel plate, reinforced with 2½″ thick spacer plates. An ingenious clutch arrangement allows for separate control to shearing and punching ends of the machine.

The handwheel shown enables the punch to be brought down on to marked position to ensure accurate punching.

Notching tools are provided for Vee and Square notching.

The angle blades that are supplied for cropping enable the section to be cut either square or up to 45 degrees on the mitre.

CAPACITY

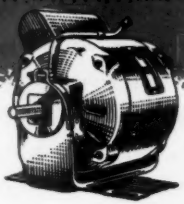
Punching : ⅞″ through ⅝″ plate.
Shearing : ⅝″ plate.
Cropping : 7″ by 3″.
Angle or Tee : 3″ by 3″ by ⅝″ square.
Angle or Tee : 2½″ by 2½″ at 45 degrees.
Round or square bar : 1¼″.
Notching : Up to 2″ by 2″ square or Vee.
Weight : 4,000 lb.

Motorized and complete with starter gear. 400-440 v. 3 ph. 50 cy. 5 hp. Complete with one set of blades for each operation, and one punch and die of maximum size. Lubrication is by "Tecalemit" grease gun, all nipples being grouped on easily reached panels Drive is by Vee belt and a High Torque motor is fitted as standard equipment.

GEORGE COHEN SONS & CO. LTD

SUNBEAM ROAD, LONDON, N.W.10. - 'Phone : ELGAR 7222/7
STANNINGLEY, Nr. LEEDS. - - - 'Phone : PUDSEY 2241.
And at Birmingham, Newcastle-on-Tyne, Sheffield, Glasgow, Dunfermline, Bath, Manchester, Swansea, Southampton, Belfast. *Established 1834*

ONE OF THE 600 GROUP OF COMPANIES



Dependable

DELCO

ELECTRIC MOTORS

BRITISH MADE

Capacitor Start Motors, Split Phase Motors, Appliance Motors, Direct Current Motors, Refrigeration Motors.

DESCRIPTIVE LEAFLETS AVAILABLE ON REQUEST

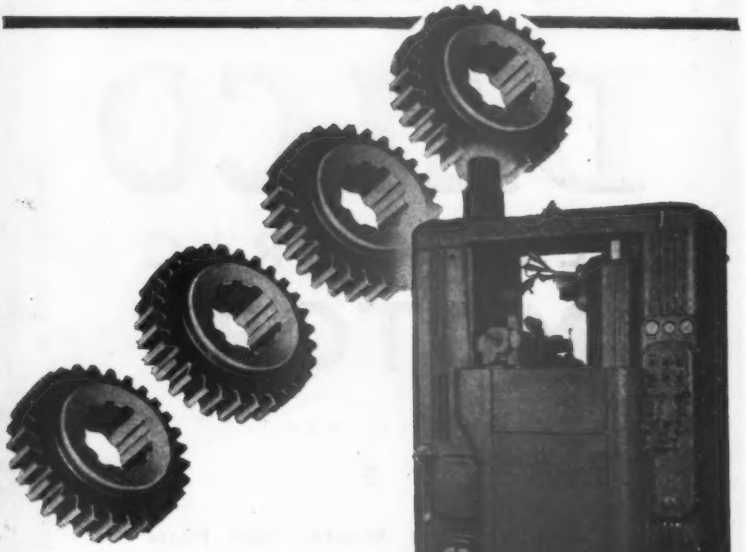
DRH DELCO-REMY-HYATT

DIVISION OF GENERAL MOTORS LTD.

GROSVENOR ROAD · LONDON · S.W.1

CONSISTENT ACCURACY WITH HIGH OUTPUT

• • • • is the primary advantage offered by the Barber-Colman 8-10 Vertical Hobber. This machine has a capacity of 8" diameter by 10" long and is designed for high speed production of spur and helical gears or splines. Extra heavy, rigid structure plus the accurate mounting of the hob on the tapered hob spindle ensures consistent accuracy while the machine maintains a high output. Simple centralized control is effected by "push button." A lever sets in motion the semi-automatic cycle, while a simple selector regulates the "8-10" to either climb or conventional cutting. Increases in hob life ranging up to 50% are achieved by fitting the new Barber-Colman 8-10 hob shifter.



THE
BARBER-COLMAN
NO 8-10 *Vertical* HOBBING MACHINE

BARBER & COLMAN LTD., MARSLAND RD., BROOKLANDS, MANCHESTER
Telephone : SALE 2277 (3 lines) Telegrams : "BARCOL," SALE

When you buy carbide cutters—look for these features

Solid braze-free Wimet blades.
Ample chip clearance.
Rigid blade support.
Simple clamping for easy blade adjustment and renewal.
Robust forged steel body.

Wimet
KNOW HOW

The WICKMAN *Multimill*

has them all

PRIMARY & SECONDARY RAKES

Experience in machining many materials has proved beyond doubt the advantages of positive radial rakes for cast iron and steels up to 45 tons tensile strength, whereas certain other materials require machining with reduced rakes.

It is not necessary that negative rakes should continue across the full surface of chip contact. They can be applied in the form of primary rakes, not more than four feeds wide.

A secondary top rake in many instances allows full freedom of chip flow over the surface of the blade, resulting in power savings up to 25 per cent, as compared with the continuous negative rake.

This is an extract from the latest Wimet Publication S.T.61 dealing with milling technique, etc. Write for your copy, today.

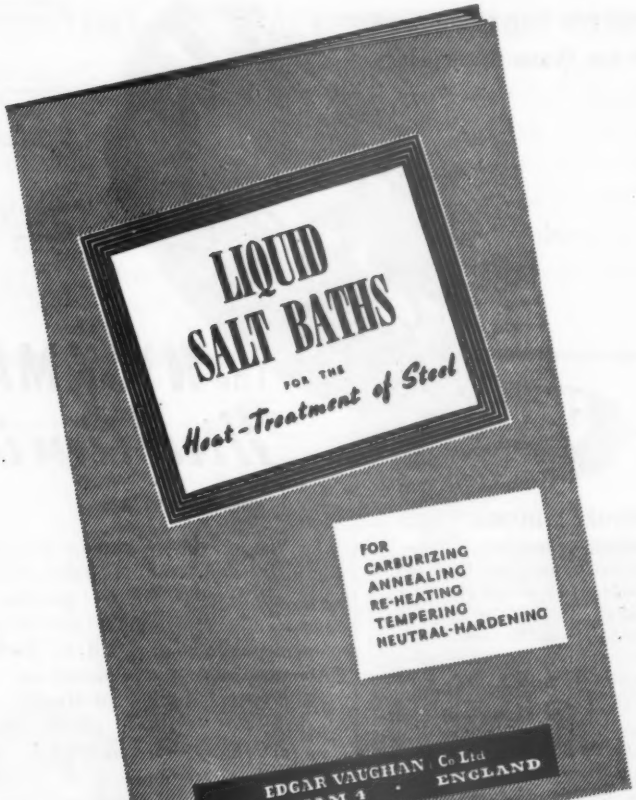
Exploiting the Wickman principle of primary and secondary rakes, Wickman 'Multimill' cutters are proving their outstanding superiority for all milling operations. Load-tested in Wickman's Demonstration Department on a wide range of materials, 'Multimill' cutters consistently yield a vastly improved metal removal rate and longer cutting life. They are made in two styles for cutting steels or cast-iron and non-ferrous materials; with standard interchangeable 'Wimet' Tungsten Carbide blades, available from stock.

"THE WIMET AGE," *a 16 mm. instructional sound film on the Application of Tungsten Carbide Tools is available for exhibition in Engineering Works, Technical Colleges, etc. Please write for details.*

Wickman for Wimet TUNGSTEN CARBIDE

A. C. WICKMAN LTD · COVENTRY · ENGLAND

LONDON · BRISTOL · BIRMINGHAM · LEEDS · GLASGOW
MANCHESTER · NEWCASTLE · BELFAST



A BOOKLET
IS AVAILABLE
ON REQUEST

RESEARCH SERVICE

EDGAR VAUGHAN
& CO. LTD.
BIRMINGHAM, 4
ENGLAND

LINEDEX

available now for quick delivery

Linedex is a fast convenient visible strip index, the ideal quick reference equipment. The indexing information is carried on individual strips, easily inserted or removed, which are supplied in 4", 5", 6" or 8" widths, and $\frac{1}{16}$", $\frac{1}{8}$", $\frac{1}{5}$", or $\frac{1}{2}$" deep, according to the amount of information they are to carry. Tinted inserts, plus distinctive signals, give facility for visual classification. Three alternative holding devices — Desk Stands, Wall Brackets or Rotary Stands — enable thousands of items to be concentrated within so small a compass, and indexed so conveniently, that each can be referred to instantly. *Write now for a copy of our new illustrated folder.*

Remington Rand

REMINGTON RAND LTD., Dept. 31, Commonwealth House, 1 New Oxford St., London, W.C.1.
Telephone CHAncery 8888 **Sales Offices and Service Depots throughout Great Britain**

If you have an inspired moulding idea that seems impossible, don't dismiss it right away. Get in touch with us and we'll "have a cut at it" by injection moulding. The more difficult it is the more we like it! . . . . .

QUOTATION BY RETURN POST

A FEW OF OUR SATISFIED CUSTOMERS

Aladdin Industries Ltd.
Champion Electric Corporation.
E. K. Cole Ltd.
Crystal Products Ltd.
Decca Navigator Co. Ltd.
General Electric Co. Ltd.
Lightning Fasteners Ltd.
Newey Bros. Ltd.
Plessey Co. Ltd.
Pye Ltd.
Reeves & Sons Ltd.
Simmonds Aerocessories Ltd.
Slazengers Ltd.
S. Smith & Sons (England) Ltd.
Wilmot-Breeden Ltd.
Yard-o-led Pencil Co. Ltd.

You can rely on

PUNFIELD & BARSTOW
(Mouldings) Ltd.

BASIL WORKS, WESTMORELAND ROAD, QUEENSBURY, LONDON, N.W.9
'Phone : COLindale 7160 & 7956. 'Grams : "Punfibars, Hyde, London."

FOR INJECTION MOULDINGS

STRONG
Unbrako socket screws are a superior product, of great strength and a perfect finish.
TOUGH
Will withstand excessive vibration and stress.
RELIABLE
Every screw is inspected and every batch tested.
UNBRAKO
BURNABY ROAD, COVENTRY
Stocked and Distributed by CHARLES CHURCHILL & CO., LTD
COVENTRY ROAD, SOUTH YARDLEY, BIRMINGHAM 25

MODERN ★

SELF-OPENING STUD SETTERS

● The ONLY Tool to include all the features that contribute to fast and efficient stud setting.

● Studs are driven to a predetermined setting when driving jaws open.

● Operated by ANY portable tool or in a drill press.

TWO SIZES — CAPACITY $\frac{5}{16}$ in. TO $\frac{7}{8}$ in.

CATMUR MACHINE TOOL CORPORATION LTD

WHITEHEAD HOUSE, 247-9 Vauxhall Bridge Rd., LONDON, S.W.1

Telephone : WHitehall 0094-5 (Extn. 4 Mr. Langley)

NEWALL BRANDED BOLTS

Newall Hitensile... Newalloy... Newallastic... Newall Hi-tem

... are recognised by engineers as having *unique qualities.* We shall be happy to supply any engineer designer who is interested with details of the various bolts and studs, which cover the full range of modern requirements.

A. P. NEWALL & CO., LTD. POSSILPARK GLASGOW

Quite a lot of thought has gone into the compilation of our latest brochure 'Cutting Fluids.' It describes all the FLETCHER MILLER cutting media in regular production, consisting of 6 soluble grades and 15 straight oils, almost a machine shop service in itself! There are also practical hints on usage, a helpful recommendation chart and some of the best photographs of cutting oils in action you will find between two covers. Ask for Publication S.P.173 on your trade noteheading.

Cutting Fluids by FLETCHER MILLER LTD

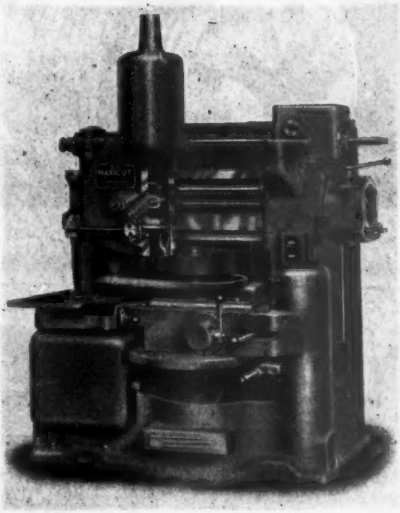
HEAD OFFICE & WORKS:
ALMA MILLS, HYDE, Nr. MANCHESTER
Phone: HYDE 781 *Grams:* EMULSION, HYDE

BRANCH WORKS:
SILVERDALE RD., HAYES, MIDDLESEX
BILHAY ST., WEST BROMWICH, STAFFS

CF10

MAXICUT No. 3A

HEAVY DUTY GEAR SHAPER



This new Gear Shaping Machine with a capacity up to 18" P.C.D. has a new workspindle slide and combines great rigidity and accuracy over long periods

Controls make for effortless operation and quick change-overs

Production estimates gladly sent on receipt of your blueprints

Write for Cata'ogue No. D.B.C. 200

MANUFACTURED BY

DRUMMOND BROS. LTD

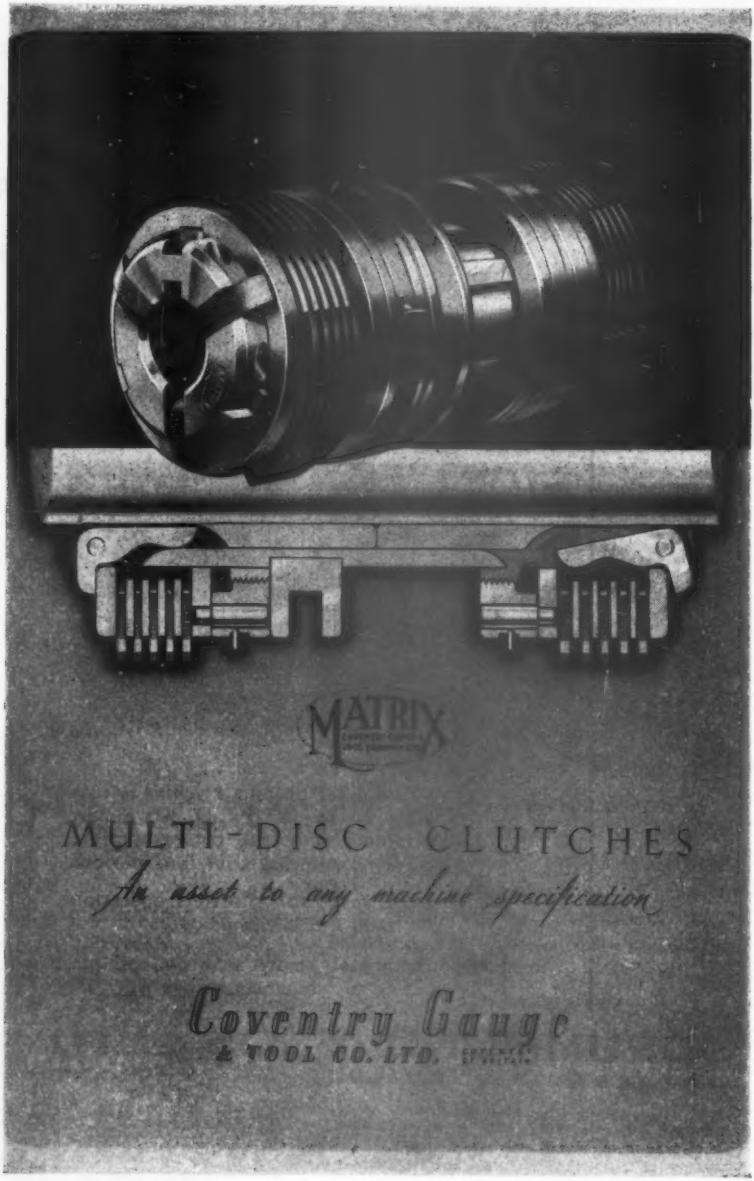
RYDES HILL · GUILDFORD · ENGLAND

Sales and Service for the British Isles

DRUMMOND-ASQUITH (Sales) LTD · KING EDWARD HOUSE · NEW STREET BIRMINGHAM

Phone : Midland 3431-2-3. Grams : Maxishape, B'ham.

also at LONDON *and* GLASGOW.


MATRIX
MULTI-DISC CLUTCHES
An asset to any machine specification
Coventry Gauge
& TOOL CO. LTD.

The Council of the Institution

1948-49

President
DR. H. SCHOFIELD, C.B.E.

Chairman of Council
J. E. HILL

Vice-Chairman
W. C. Puckey

Past Presidents
Sir George E. Bailey, C.B.E. — The Rt. Hon. Viscount Nuffield, G.B.E.
The Rt. Hon. Lord Sempill, A.F.C. — N. Rowbotham, C.B.E.

Vice-Presidents
T. Fraser, C.B.E. E. W. Hancock, M.B.E. Sir Norman V. Kipping J. D. Scaife

Section Presidents

F. Bernard White.....*Birmingham*
T. B. Gray.....*Calcutta*
A. F. Pool.....*Cornwall*
W. N. Ellerby.....*Coventry*
J. B. Webster.....*E. Counties*
J. L. Bennet.....*Edinburgh*
H. Gardner.....*Glasgow*
H. Nutton.....*Halifax*
J. Wombwell.....*Leicester*
B. A. Williams, O.B.E.....*Liverpool*
F. P. Laurens, O.B.E.....*London*
J. W. Buckley.....*Luton*
H. G. Gregory.....*Manchester*
A. J. Bowron.....*N. Eastern*
J. C. Breakey.....*N. Ireland*
J. H. Bingham.....*Nottingham*
T. A. Westall.....*Preston*
G. R. Pryor.....*Sheffield*
N. J. Cottell.....*Southern*
W. J. Vaughan.....*S. Wales & Mon.*
J. E. Attwood.....*Western*
A. J. Aiers.....*Wolverhampton*
W. Armstrong, M.B.E.....*Yorkshire*

Additional Section Representatives

H. Burke.....*Birmingham*
F. C. White.....*Birmingham*
H. Eckersley.....*Coventry*
H. W. Bowen, O.B.E.....*London*
F. E. Maer.....*London*
R. K. Allan.....*Luton*
F. W. Cranmer.....*Manchester*
M. Seaman.....*Manchester*
J. F. Gibbons.....*N. Eastern*
A. S. Johnstone.....*Nottingham*
H. Kirkman.....*Preston*
.....*Western*
H. Tomlinson.....*Wolverhampton*
W. J. Marshall.....*Wolverhampton*
Lt.-Col. C. W. Mustill, M.B.E.....*Yorkshire*

Chairmen of Standing Committees
J. E. Baty E. P. Edwards F. H. Perkins A. L. Stuchbery

Elected Members
F. Bloor, R. M. Buckle, B. H. Dyson, L. R. Evans, R. C. Fenton, W. V. Hodgson, E. J. H. Jones, M.B.E., R. Kirchner, Prof. T. U. Matthew, H. J. Swift, O.B.E., M. H. Taylor, S. Wright

Australian Sub-Council

President E. C. PARKINSON
Chairman E. L. OLFEN

Vice-Chairman
E. B. Richardson

Elected Members
H. le Cheminant — W. G. Davis
J. Finlay — F. Glover
S. D. McPhee — C. Pullen
J. M. Steer — J. E. Strick

South African Sub-Council

President A. B. ANDERSON
Vice-President A. C. WOTHERSPOON

Past Presidents
L. H. L. Badham — J. Henry
D. Lion-Cachet

Elected Members
R. H. Arbuckle — W. Caldwell
P. F. Evans-Watt — E. G. Fox
W. Gillespie — G. Godfrey
D. A. Petrie — J. Renwick
H. H. Waters

Director and General Secretary of the Institution
Major C. B. Thorne, M.C.

Education Officer : T. B. Worth

HONORARY MEMBERS OF THE INSTITUTION

The Council has for some time past conferred on those who have rendered the Institution long and distinguished service the title of Honorary Member.

At the present time, the Honorary Members of the Institution are :

Mr. T. Fraser, C.B.E.

Sir Ernest J. H. Lemon, O.B.E.

Dr. G. Schlesinger.

Sir Alfred Herbert, K.B.E.

The Rt. Hon. Viscount Nuffield, G.B.E., M.A., D.C.L.

The Rt. Hon. Lord Sempill, A.F.C.

Section Honorary Secretaries

Birmingham	A. J. Mansell, 204, Alcester Road South, Birmingham, 14.
Calcutta	J. Warren-Boulton, Machine Tools (India) Ltd., Stephen House, Dalhousie Square, Calcutta.
Cornwall	F. W. Spencer, "Pembroke," Phillack, Hayle, Cornwall.
Coventry	A. Hill, 382, Ansty Road, Coventry.
Derby Sub-Section	A. Short, 26, St. Albans Road, Derby.
Eastern Counties	L. A. Childs, Crane Ltd., Nacton Road, Ipswich.
Edinburgh	P. H. Lee, 39, Corstorphine Bank Drive, Edinburgh, 12.
Glasgow	W. P. Kirkwood, "Morar," Sandfield Avenue, Milngavie, Dumbartonshire.
Halifax	Miss N. E. Bottom (acting), Hopkinsons, Ltd., Huddersfield.
Leicester and District	C. F. Gazard, 27, Stretton Road, Leicester.
Lincoln Sub-Section	E. E. Ingleton, "Glenroy," Lincoln Road, North Hykeham, Lincoln.
Liverpool	F. Whitehead, 38, Cooper Avenue North, Mossley Hill, Liverpool, 18.
London	H. W. Townsend, Philips Electrical Ltd., New Road, Mitcham Junction, Surrey.
Luton and Bedford	R. M. Buckle, 238, Cutenhoe Road, Luton, Beds.
Manchester	H. E. Wheeler, 4, Marlfield Road, Grappenhall, Warrington, Lancs.
Melbourne (Victoria, Australia)	C. Pullen, 13, Immarna Road, Camberwell, E.6.
North Eastern	H. B. Topham, C. A. Parsons & Co., Ltd., Heaton Works, Newcastle, 6.
Northern Ireland	W. G. Wyman, "Linden Lea," Cultra, Co. Down.
Nottingham	C. N. T. Manfull, Chellaston House, Thurgarton Street, Nottingham.
Preston	F. M. Kemp, Clayton, Goodfellow & Co., Ltd., Atlas Iron Works, Blackburn, Lancs.
Sheffield	E. Levesley, 259, School Road, Sheffield, 10.
Shrewsbury Sub-Section	R. O. L. Cadman, 5, Perseverance Terrace, East Road, Ketley Bank, Oakengates, Salop.
South Africa	The Secretaries, Institution of Production Engineers, Barclays Bank Buildings, Corner Commissioner and Harrison Streets, Johannesburg.
Southern	S. Coates, 51, Westbury Road, Regent's Park, Shirley, Southampton.
South Wales and Monmouthshire	S. T. O. Davies, 4, St. Cadoc Road, Heath, Cardiff.
Sydney (New South Wales)	J. M. Steer, 260/262, Kent Street, Sydney.
Western	A. Eustace, 19, Ferndale Road, Northville, Bristol, 7.
West Wales Sub-Section	H. P. Sanderson, I.C.I. Ltd., (Metals Division) Waunarlwydd, near Swansea.
Wolverhampton	W. J. Marshall, Moston Park, Lee Brockhurst, Salop.
Yorkshire	J. L. Townend, 26, Moor Allerton Drive, Street Lane, Leeds, 7.

Graduate Section Honorary Secretaries

Birmingham	N. Newey, 185, Selly Oak Road, King's Norton, Birmingham, 30.
Coventry	R. L. Crow, 65, Broad Lane, Coventry.
Halifax	T. Marsden, 6, Kell Lane, Stump Cross, Halifax.
London	R. T. Mustard, 47, King's Road, Woodham, Weybridge, Surrey.
Luton	F. A. Rowley, 195, Hitchin Road, Luton, Beds.
Manchester	W. R. Matley, 58, Heyscroft Rd., Withington, Manchester, 20
North Eastern	G. D. Robinson, 188, Westgate Road, Newcastle, 4.
Wolverhampton	L. C. Jones, 1, Merridale Lane, Wolverhampton, Staffs.
Yorkshire	S. Metcalfe, "Marstan," 20, Heath Mount, Leeds, 11.

REGINALD ROY HUTCHINGS, M.I.P.E.

REGINALD ROY HUTCHINGS, M.I.P.E.

The engineering experience and knowledge of Mr. R. R. Hutchings, Production Engineer of the world-famous concern, W. H. Allen, Sons & Co., Ltd., of Bedford, covers a vast field from quantity production of light and medium machinery to unit construction of heavy engineering plant.

Born at Yeovil, Somerset and educated in the same county, Mr. Hutchings was a pupil to Petters, Ltd., Yeovil, Oil Engine Manufacturers, where he received training in all departments, and concurrently attended the Yeovil Technical Institute.

On completing his apprenticeship, he became a Jig and Tool Draughtsman at Rolls-Royce, Ltd., Derby, and was later responsible for the design of certain equipment. Subsequently he accepted a position on the Editorial Staff of " The Automobile Engineer and Engineering Production," dealing with production methods, factory organisation, and machine tools. Here his duties included visits to all types of engineering works in various parts of the country.

Following a short period as Production Engineer to the Watford Electric and Manufacturing Co., Ltd., Mr. Hutchings then joined W. H. Allen, Sons & Co., Ltd., as Chief of the Operation Planning and Ratefixing Department, and was later appointed to his present position. He is also Vice-Chairman of the Executive Committee of the Works Recreation Club.

Mr. Hutchings, who is a past President of the Luton Section and continues to play an active part on the Section Committee, is not only a Founder Member of the Institution, but has the unique honour of being No. 1 on the Roll of Members. Since its inauguration, he has always taken a keen interest in the Institution's welfare and activities, and served as a Member of Council for some years.

INSTITUTION NOTES

March, 1949

MEETING OF COUNCIL The next meeting of Council will be held on Thursday, 28th April, 1949, at 36, Portman Square, W.1 at 11-00 a.m., and will be followed by an Extraordinary General Meeting, at 4 p.m.

TECHNICAL EDUCATION

Borough Polytechnic, S.E.1. The Governors invite applications for the appointment as Senior Assistant Lecturer in the Department of Mechanical Engineering. Candidates should be qualified to teach mechanical engineering to degree standard for the Higher National Certificate. The salary will be in accordance with the Burnham Scale for Senior Assistants. Further particulars may be obtained from the Principal, Borough Polytechnic, Borough Road, S.E.1.

Merchant Venturers' Technical College, Bristol. Applications are invited for appointment as Lecturer, with special responsibility in Production Engineering. It is intended to develop a Higher National Certificate Course in Production Engineering and to establish an experimental machine tool laboratory. The successful candidate must be capable of undertaking the development of these provisions *ab initio*. Previous experience of teaching production engineering subjects and up-to-date industrial background is essential. The salary will be in accordance with the Burnham scale, with increments allowed for teaching and industrial experience, war service, and additional responsibility allowance. Further particulars may be obtained from The Registrar, Merchant Venturers' Technical College, Unity Street, Bristol, 1.

HIGHER NATIONAL CERTIFICATE IN PRODUCTION ENGINEERING At a meeting of the Joint Committee for the Higher National Certificate in Production Engineering on November 26th, 1948, it was reported that for the session 1947-48 nineteen colleges entered candidates for the examination. The total number of entries was 389, and the total number of passes 319. These figures represent an increase of 82 in the number of entries, and 91 in the number of awards.

At the above meeting it was agreed to publish a pamphlet giving information concerning Higher National Certificates in Production Engineering, and the location of colleges offering courses, and it is hoped that these pamphlets will shortly be available, on request from Head Office.

COURSES IN PRODUCTION ENGINEERING

In addition to the list of colleges conducting courses for the Higher National Certificate in Production Engineering which appeared in the January issue of the Journal, courses are now being held at the Croydon Polytechnic. Full details may be obtained from the Principal.

NEWS OF MEMBERS

Mr. F. S. Armitage, A.M.I.P.E. has been engaged as Senior Planner at A. V. Roe (Canada), Malton Airport, Malton, Ontario.

Sir Charles Bartlett, M.I.P.E., Managing Director of Vauxhall Motors, Ltd., has joined the Industrial Health Research Board.

Mr. T. J. Brennan, Int.A.M.I.P.E., is now Works Manager to The Platarg Instrument Co. (Dental Equipment), London.

Mr. D. J. H. Bridge, Grad.I.P.E., is now Chief Design Engineer to the Canadian Branch of Fisher & Ludlow, Ltd.

Mr. D. L. Campbell, A.M.I.P.E., has been appointed Inspection Superintendent of Albion Motors, Ltd., Glasgow.

Mr. W. A. Carter, A.M.I.P.E., is now managing his own business, Carter Screw & Engineering Co., specialising in the manufacture of Press Tools, at Datchet, Bucks.

Mr. S. N. Chatterjee, Int.A.M.I.P.E., has been appointed Assistant Works Manager Production, Ordnance Factory, Dehra Dun, Johore Province, India.

Mr. James Farmery, A.M.I.P.E., has accepted the appointment of Principal of the Cumberland Technical College, Workington.

Mr. Donald Foulger, Grad.I.P.E., has been appointed Mechanical Engineer, Public Works Department, Gold Coast.

Mr. James France, M.I.P.E., M.I.Mech.E., is now Works Manager of the Parkinson Stove Co., Ltd., Birmingham.

Mr. E. Granger, A.M.I.P.E., is now Consultant Engineer with Associated Industrial Consultants, Ltd., London.

Mr. R. Hacker, A.M.I.P.E., has been appointed General Manager of the Watford Division of H. J. Thormann Engineering Co., Ltd.

Mr. A. H. Langford, M.I.P.E., Director and General Manager of Heenan & Froude, Ltd., Worcester, has been appointed Director of three subsidiary companies: Court Works, Ltd., Salop; Industrial Waste Eliminators, Ltd., London; and the New Destructor Company, Ltd., Worcester.

Mr. Norman T. Meek, Grad.I.P.E., is now lecturing in Mechanical Engineering Drawing at the School of Electronics, T.R.E., Ministry of Supply, Great Malvern.

Mr. L. D. McGeady, A.M.I.P.E., of Sydney Section, is spending three years in the United Kingdom in order to study mass production methods.

Mr. R. A. McLeod, A.M.I.P.E., A.M.I.Mech.E., is now Assistant Production Engineer with Glenfield and Kennedy, Hydraulic Engineers, Kilmarnock.

Mr. J. Morris, M.I.P.E., has been appointed Technical Director to the Engineering Group of Metal Industries, Ltd.

Mr. C. M. Patel, A.M.I.P.E., is now Works Manager of Jerrican Factory, Wadala, Bombay.

Mr. Eric F. Priest, A.M.I.P.E., is now General Works and Production Manager to the Electro Dynamic Construction Co., Ltd.

Mr. B. Pugh, M.I.P.E., has been appointed Head of the Mechanical Engineering Department of the Municipal Technical College, Hull.

Mr. H. Teasdale, B.Sc., A.M.I.P.E., has been appointed Principal of the Apprentices' Technical School in the Engine Division of the Bristol Aeroplane Company, Filton.

Mr. W. E. Wadman, A.M.I.P.E., has been appointed Head of the York Technical College.

Major E. A. Wimberley, O.B.E., M.I.P.E., is now Chief Factory Engineer, Windscale Works, Sellafield, Cumberland, under the Ministry of Supply, Division of Atomic Energy.

OBITUARY

The Institution recently learned, with deep regret, of the death of Mr. Nathaniel Greenhalgh, M.I.P.E., of Solihull, Birmingham. Mr. Greenhalgh was the Sales Director of Burton, Griffiths & Co., Ltd., Marston Green, and had been associated with the B.S.A. Tool Group for many years.

During the war, from 1941 to 1944, he was attached to the Ministry of Supply as Director of Jigs, Fixtures and Gauges.

Mr. Greenhalgh's death will be keenly felt by his many friends in the engineering industries, and especially in the Birmingham Section, where he took an active and enthusiastic interest in the activities of the Institution.

The Institution also regrets to announce the death of Mr. B. W. Gray, Grad.I.P.E., of the Birmingham Graduate Section.

"ORGANISATION AND CONTROL OF PRODUCTION"

In response to many requests, this paper has now been reprinted, and is available from Head Office, price 5/- per copy.

BOOKS RECEIVED

"The Technique of Industrial Labour Payment" by C. L. Guest. MacDonald & Evans, London. 35/- net.

The subject of this book is one of the most complex problems with which we are faced in industry today, and the manner in which it has been tackled reflects great credit on the author.

Some of the subjects covered are the advantages and disadvantages of the various payment by results schemes ; the setting up of a time study department ; factory payment systems ; and the Acts of Parliament covering the employment of labour in this country at the present time.

The book will be of very great assistance and give confidence to those who are connected with present day labour payments. As the author is connected with a large industrial concern manufacturing a variety of products, it is felt that the book contains the results of many years of practical experience.

R.E.L., M.I.P.E.

"Dimensions in Engineering Theory" by G. W. Stubbings. Crosby, Blackwood & Son, Ltd. 7/6d. net.

This little book, of about 100 pages, deals wholly with units and dimensions and is probably the first to be available to engineering students. It will be particularly useful to those taking degree courses. Apart from brief mention of this subject in some textbooks, it has been dealt with hitherto only in monographs written primarily for physicists.

A book written for engineers must necessarily include gravitational units and the author has discussed this subject adequately in its proper relationship to the other systems. The inclusion of the M.K.S. (Metre, Kilogram, Second) system is welcome as being of much more convenient magnitude than the C.G.S. system of units and it has a strong claim for universal adoption. (The unit of force in the M.K.S. system, the newton, is roughly equal to the weight of a quarter of a pound, while that of the C.G.S. system, the dyne, is about equal to one 28,000th part of the weight of an ounce.)

After describing the units of various existing systems, the author deals with the elementary theory of dimensions and the application of the theory ; this is followed by separate chapters on "Theory of the Dynamics of Rotation," "Dimensions of Thermal Quantities" and "Dimensions of Electrical Quantities."

The more use a student makes of "Dimensions" the better his understanding will be of the quantities and equations with which he has to deal. In Intermediate and General (Pass) Degree courses, he is taught to make sure that mechanical and physical expressions are dimensionally correct ; and in Honours courses "Dimensions" are used as a means of deriving relations which the student may be unable to derive by other means.

This book has been carefully planned and written ; it is lucid and logical, well-produced and indexed. It can be recommended to engineering students as a very desirable supplement to their regular text-books.

J.E.B., M.I.P.E.

" Management Through Leadership "—a series of lectures by Sir Frederick Bain, M.C., Lt.-Col. L. Urwick, O.B.E., M.C., M.A., M.I.P.E., Sir Charles Mander, Bt.D.L., T.D., Sir George Chester, Gen. Sir William Slim, K.C.B., G.B.E., D.S.O., M.C., Sir Charles Bartlett, M.I.P.E., Sir Charles Renold, and Sir Harold West. Published by the Institute of Industrial Administration (Sheffield Centre). 2/10d., including postage.

" Turret Tooling " by H. Howard Freeman, Int.A.M.I.P.E., M.I.P.I. Sir Isaac Pitman & Sons, Ltd., London. 12/6d. net.

ISSUE OF JOURNAL TO NEW MEMBERS Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

IMPORTANT In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

SECTION MEETINGS

The following meetings have been arranged to take place in March and April, 1949. Where full details are not given, these have not been received at the time of going to press.

March

2nd NOTTINGHAM SECTION. The Annual General Meeting will take place at Victoria Station Hotel, Nottingham, at 7-00 p.m.

2nd PRESTON SECTION. A lecture on " Modern Surface Coating and Post War Synthetic Finishes " will be given by Mr. C. A. J. Taylor, M.Sc., A.R.I.C., at the Harris Institute, Preston, at 7-15 p.m.

2nd WOLVERHAMPTON SECTION. A lecture on " Colour Schemes for Factory and Machines " will be given by Mr. S. A. Wood, at the County Technical College, Wednesbury, at 7-00 p.m.

March—*cont.*

3rd GLASGOW SECTION. An informal discussion on "Developments in Production Engineering — Education" will be held at the Royal Technical College, Glasgow, at 7-30 p.m.

4th WEST WALES SUB-SECTION. An "Industrial Digest" evening will be held at the Technical College, Swansea, at 7-30 p.m.

5th YORKSHIRE GRADUATE SECTION. The Annual General Meeting will be held at the Great Northern Hotel, Leeds, at 2-15 p.m., followed by a lecture on "Wire and Its Application to Industry" given by Dr. R. Goodacre, B.Sc.

7th YORKSHIRE SECTION. The Annual General Meeting, followed by a film, "Mechanical Handling," will be held at the Hotel Metropole, Leeds, at 7-00 p.m.

8th BIRMINGHAM GRADUATE SECTION. The Annual General Meeting will be held at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7-00 p.m., with an Address by the Chairman, Mr. J. D. Berry, Grad.I.P.E.

8th COVENTRY GRADUATE SECTION. A lecture on "Corby Iron and Steel Works of Stewart & Lloyds, Ltd.", will be given by Mr. A. Stirling, B.Sc., in Room A5, Technical College, Coventry, at 7-15 p.m.

8th MANCHESTER SECTION. A Works Visit to Manchester Oil Refinery, Ltd., Trafford Park, Manchester, will take place at 2-15 p.m.

9th LUTON GRADUATE SECTION. A lecture on "Powder Metallurgy and the Engineer" (illustrated by slides) will be given by Mr. H. W. Greenwood at the Midland Hotel, Luton, at 7-30 p.m.

9th SHEFFIELD SECTION. A lecture on "Mass Production of a British Alarm Clock" will be given by Mr. E. Desmond, at the Royal Victoria Station Hotel, Sheffield, at 6-30 p.m.

9th WESTERN SECTION. A lecture on "The Metallurgist's Place in Production Engineering" will be given by Mr. E. R. Gadd, F.I.M., at the Grand Hotel, Bristol, at 7-15 p.m.

11th EASTERN COUNTIES SECTION. A lecture on "Budgetary Control" will be given by Mr. B. B. Beaumont, in the Lecture Hall, Electric House, Ipswich, preceded by the Annual General Meeting at 6-00 p.m.

March—*cont.*

11th COVENTRY SECTION. A lecture on " Recent Developments in Automobile Gear Production " will be given by Dr. W. A. Tuplin, M.I.Mech.E., in Greyfriars Room, Geisha Cafe, Coventry, at 7-00 p.m.

12th COVENTRY GRADUATE SECTION. A Works Visit will take place to Stewart & Lloyds, Ltd., Corby.

14th HALIFAX SECTION. A lecture on " Mechanical Mishaps and their relation to Design and Workmanship," will be given by Mr. G. E. Windeler, M.I.Mech.E., M.Cons.E., M.I.Mar.E., at the White Swan Hotel, Halifax, at 7-00 p.m.

15th LINCOLN SECTION. The Annual General Meeting will be held at the Lincoln Technical College, at 7-15 p.m., followed by a lecture on " Management at the Crossroads " given by Mr. Lewis C. Ord.

16th LIVERPOOL SECTION. A lecture on " Difficulties and Developments in Deep Drawing and Pressing " will be given by Dr. J. D. Jevons, B.Sc., F.R.I.C., F.I.M., at Radiant House, Bold Street, Liverpool, at 7-15 p.m.

16th EDINBURGH SECTION. A lecture on "Valid Incentives" will be given by Mr. E. C. Gordon England, M.I.P.E., F.I.N.I., F.R.Ae.S., F.I.I.A., at the North British Station Hotel, Edinburgh, at 7-30 p.m., preceded by the Annual General Meeting.

16th BIRMINGHAM SECTION. The Annual General Meeting will take place at the James Watt Memorial Institute, Great Charles Street, Birmingham,at 7-00 p.m., followed by a lecture on " Recent Developments in Grinding Practice " given by Mr. R. J. M. Whibley, A.M.I.Mech.E.

16th MANCHESTER GRADUATE SECTION. The Annual General Meeting will take place at Reynolds Hall, College of Technology, Manchester, at 6-45 p.m., followed by a lecture on " Costing in Relation to the Production Engineer " given by Mr. W. A. Eastwood, A.C.W.A.

16th MANCHESTER SECTION. A lecture on " Development and Application of all Branches of Resistance Welding " will be given by Mr. J. Dowse at the Mechanics Institute, Crewe, at 7.15 p.m.

17th WESTERN SECTION. A lecture on " Design for Welding " will be given by Mr. F. Jukes, A.M.I.Mech.E., A.M.I.W., at Exeter, at 7-15 p.m.

March—*cont.*

17th GLASGOW SECTION. The Annual General Meeting will take place at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, at 7-30 p.m., followed by a lecture on " Production Research in America " given by Dr. H. Orenstein, M.I.P.E.

17th LEICESTER SECTION. The Annual General Meeting will take place in Room 104, Leicester College of Technology, The Newarkes, Leicester, at 7-00 p.m. There will be an Address by the Section President, and films on a popular technical subject.

18th NORTH EASTERN GRADUATE SECTION. A lecture on " Grinding " will be given by Mr. J. Stanier at Neville Hall, Newcastle-on-Tyne, at 6-30 p.m.

19th YORKSHIRE SECTION. The Annual Dinner will be held at the Hotel Metropole, Leeds, at 6.30 p.m. for 7-00 p.m.

21st MANCHESTER SECTION. A lecture on " Modern Alarm Clock Production " will be given by Mr. A. W. Marshall, at the Manchester College of Technology, at 7-15 p.m.

21st NORTH EASTERN SECTION. A lecture on " Noise and Vibration in Machinery " will be given by Dr. W. A. Tuplin, M.I.Mech.E., at Neville Hall, Newcastle-on-Tyne, at 6-30 p.m.

23rd WESTERN SECTION. The Annual General Meeting will take place at the Grand Hotel, Bristol, at 7-15 p.m.

24th LONDON SECTION. The Annual General Meeting will take place at the Assembly Hall, Royal Empire Society, Northumberland Avenue, W.C.2 (Craven Street Entrance), at 7-00 p.m., followed by a lecture on " Pressure Welding " given by Mr. R. F. Tylecote, M.Sc., A.M.I.E.E.

25th COVENTRY SECTION. The Annual General Meeting will be held in Greyfriars Room, Geisha Cafe, Coventry, at 7-00 p.m.

26th BIRMINGHAM SECTION. The Section Annual Dinner and Dance, will be held at the Botanical Gardens, Edgbaston.

26th YORKSHIRE GRADUATE SECTION. A Works Visit will take place to Price (Tailors), Ltd., Leeds, at 2-30 p.m.

28th DERBY SUB-SECTION. The Annual General Meeting will take place at the Art School, Green Lane, Derby, at 7-00 p.m., followed by a sound film " Precise Measurement for Engineers."

March—*cont.*

30th HALIFAX GRADUATE SECTION. A lecture on " Metallurgical Factors Influencing the Machinability of Steels " will be given by Mr. L. W. Johnson, M.I.P.E., at the Technical College, Huddersfield, at 7-00 p.m.

April

1st WEST WALES SUB-SECTION. A Film, " Patterns and Progress at Ebbw Vale," will be shown at 7-30 p.m.

4th YORKSHIRE SECTION. A lecture on " Industrial Politics " will be given by Mr. Lewis C. Ord, at the Hotel Metropole, Leeds, at 7-00 p.m.

5th BIRMINGHAM SECTION. An all day Works Visit will be made to the Austin Motor Company, Limited, at Longbridge.

6th NOTTINGHAM SECTION. A lecture on " Industrial Lighting " will be given at Victoria Station Hotel, Nottingham, at 7-00 p.m.

6th WESTERN SECTION. A lecture on " Rolled Steel Sections" will be given by Mr. G. Butler, at the Grand Hotel, Bristol, at 7-15 p.m.

6th LUTON GRADUATE SECTION. The Annual General Meeting will take place at the Midland Hotel, Luton, at 7-00 p.m., and will be followed by a Graduates' Evening at 7-30 p.m.

6th WOLVERHAMPTON SECTION. A lecture on " Centralisation versus Decentralisation in Industry " will be given by Mr. Lewis C. Ord, at the Gas Company's Offices, Wolverhampton, at 7-00 p.m.

8th EASTERN COUNTIES SECTION. A lecture on " Practical Approach of Research to Industry " will be given by Mr. H. W. Hobbs, M.I.P.E., at the Lecture Hall, Electric House, Ipswich, at 7-15 p.m.

9th YORKSHIRE GRADUATE SECTION. A Works Visit will take place to W. & T. Avery, Ltd., Sherburn-in-Elmet, near Leeds, at 2-30 p.m.

11th HALIFAX SECTION. A lecture on " Product Design " will be given by Mr. B. G. Bowden, M.I.Mech.E., M.S.A.E., M.S.I.A., at the White Swan Hotel, Halifax, at 7-00 p.m.

12th WOLVERHAMPTON GRADUATE SECTION. A lecture on " The Manufacture and Application of Sintered Carbides (illustrated by a film " The Wimet Age,") will be given by Dr. E. M. Trent, at the Wednesbury Technical College, at 7-15 p.m.

April—*cont.*

12th BIRMINGHAM GRADUATE SECTION. A lecture on "The Efficient Inspection of Mass Produced Parts" (preceded by a demonstration of equipment) will be given by Mr. J. Loxham, M.I.P.E. at the James Watt Memorial Institute, Great Charles Street, Birmingham at 7-00 p.m.

13th SHEFFIELD SECTION. A lecture on "How the Money Moves in Business" will be given by Mr. T. G. Rose, M.I.P.E., M.I.Mech.E., at the Royal Victoria Station Hotel, Sheffield, at 6-30 p.m.

14th LEICESTER SECTION. A lecture on "Balance in Line Production" will be given by Mr. W. Hewett, A.M.I.Mech.E., Int.A.M.I.P.E., A.I.I.A., in Room 104, College of Technology, The Newarkes, Leicester, at 7-00 p.m.

14th LONDON SECTION. A lecture on "Mechanical Mishaps and their Relation to Design and Workmanship" will be given by Mr. G. E. Windeler, M.I.Mech.E., M.Cons.E., M.I.Mar.E., at the Assembly Hall, Royal Empire Society, Northumberland Avenue, W.C.2 (Craven Street Entrance), at 7-00 p.m.

18th DERBY SUB-SECTION. A lecture on "Plastics" will be given by Mr. A. D. Whitehead, at the Art School, Green Lane, Derby, at 7-00 p.m.

18th HALIFAX GRADUATE SECTION. A lecture on "The Production of All-Metal Bus Bodies," will be given by Mr. G. L. Hart, M.I.Mech.E., at the Technical College, Huddersfield, at 7-00 p.m.

20th LIVERPOOL SECTION. The Annual General Meeting, and Address by the President will take place at the Exchange Hotel, Liverpool at 7-15 p.m. Members only.

20th EDINBURGH SECTION. A lecture on "Electronics in Industry" will be given by Mr. P. H. Briggs, B.Sc., at the North British Station Hotel, Edinburgh, at 7-30 p.m.

20th BIRMINGHAM SECTION. A lecture on "The Education of the Production Engineer," will be given by Mr. T. B. Worth, M.I.P.E., A.M.I.Mech.E., A.M.I.E.E., at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7-00 p.m.

21st GLASGOW SECTION. A lecture on "Electronics in Industry," will be given by Mr. P. H. Briggs, B.Sc., at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, at 7-30 p.m.

April—*cont.*

21st LONDON SECTION. A Works Visit will take place to J. Stone and Company, Limited, Engineers and Founders.

25th MANCHESTER SECTION. A lecture on "Social Function of Industry" will be given by Dr. A. Roberts, at the Manchester College of Technology, at 7-15 p.m.

25th NORTH EASTERN SECTION. The Annual General Meeting will take place at Neville Hall, Newcastle-on-Tyne, at 6-30 p.m.

27th HALIFAX GRADUATE SECTION. A lecture on "Modern Coal Face Machinery," will be given by Mr. J. W. L. Anderson, B.Sc., at the Technical College, Halifax, at 7-00 p.m.

ELECTION OF MEMBERS

MEETING OF COUNCIL, 20th JANUARY, 1949

The following were elected to membership by Council :—

As Members :

K. C. Appleyard, C.B.E., T.D., D.L., J.P., W. O. Alexander, P. Brown, C. Casson, F. J. Chard, T. Fairley, G. W. T. Hartwell, F. M. Hayward, A. J. Lee, A. J. Lenox, A. R. Pegler, J. Riffkin, W. Smith, F. Woodifield.

As Associate Members :

F. O. Ackroyd, E. R. Andrew, S. C. Bacon, G. E. Bainbridge, R. A. W. C. Barker, O. J. Bates, J. Beardsley, H. Beddard, H. H. Behrendt, E. W. Bennett, B. S. Billimoria, W. Bracewell, J. W. Bramall, E. R. Bray, A. J. Buchan, J. E. Coldwell, A. G. Cooper, C. C. Cooper, J. H. Croome, C. Crowther, W. R. Cutler, W. E. Darby, J. L. Elliott, G. S. Ford, H. A. Glen, E. Greaves, G. E. Greensmith, V. M. Harvey, H. G. Holman, A. E. Kay, T. S. G. Kee, E. W. Kemp, R. B. Kemball-Cook, J. Kitchen, P. Krishnaswamy, A. I. Langley, H. A. Leighton, I. B. McClure, C. B. McGregor, R. McQuillan, J. K. Marshall, L. Marshall-Wood, R. J. O. Maybury, J. Menzies, K. C. Mitter, J. D. Morrison, J. G. Nixon, W. H. Pearson, W. H. Phillips, H. M. Riordan, F. G. C. Sandiford, R. G. Smith, V. E. Smith, F. Steel, T. F. Strainge, C. J. Swift. N. G. Sykes, C. L. Taylor, A. Torkington, B. L. Towson, C. H. Tyers, E. Walshaw, L. W. Webb, F. G. S. White.

As Intermediate Associate Members :

F. W. Allen, V. Agarwala, E. C. R. Barry, H. R. Benner, A. C. Bhattacharya, H. W. Brown, J. E. L. Brown, A. W. S. Bryant, D. F. H. Bysouth, R. G. Cookson, J. F. Cooper, R. N. Das, A. Devlin, F. H. J. Dixon, G. H. Fisher, E. O. Gadsden, L. W. W. Gibson, R. L. Griffiths, G. T. W. Hall, F. R. Harris, E. T. Hartley, P. L. Hepworth, J. Hill, D. S. Hitchins, F. Jackson, J. S. James, L. Lamb, H. J. Lloyd, P. J. MacLeod, G. McPherson, R. Martland, S. P. Mookerjee, I. W. Mudge, P. G. H. Newton, G. Patrick, A. B. Roberts, C. G. Savin, B. Smith, J. J. Smith, W. J. Smith, E. G. Swain, R. J. Titherington, D. S. Whitelaw.

Re-Instatement As Intermediate Associate Member :

S. G. Barbet.

As Associates :

R. E. Ashley, W. E. J. Cross, L. Fuchs, PH.D., A. W. H. Lamond, J. T. O'Leary, W. de Palo.

As Graduates :

S. M. Banerjee, N. Beardsworth, H. Beech, G. A. Bray, M. B. Brown, P. H. A. Bryant, R. S. Cashmore, L. W. J. Clarke, J. D. Cochran, G. A. H. Codner, K. E. Cole, P. F. Cornell, D. C. Crooks, W. D. Dobell, C. J. Devereux, C. Firth, H. Gee, D. H. Goss, A. W. Guest, D. Hassall, P. M. Hooper, E. G. Horton, R. Howard, J. T. Lang, O. Laycock, D. F. Maloney, W. H. Matthews, T. A. Mejzner, H. E. Morgan, H. W. Morris, W. E. Mosse, E. C. Nicholson, P. P. Patel, J. D. Radford, P. H. Roberson, A. C. Rudra, G. D. Shaw, A. Stirling, B. E. Stokes, K. C. Thatcher.

AS STUDENTS:

N. Allen, G. G. Billington, N. F. R. Bird, D. Buckland, D. L. Clark, P. L. Cornish, B. R. Cutler, P. C. Davie, G. M. Elliot, F. Higham, A. Kendrick, R. W. Kinsbury, N. Laurens, I. E. Perriam, A. Ruddle, M. Scholes, W. S. Stacey, S. P. Vaish, J. C. Varley, J. J. Walker, D. White, J. Williams.

AFFILIATED FIRM:	CHANGE OF AFFILIATE REPRESENTATIVE
S.A. Farm Implement Manufacturers Ltd.	R. Corte.

TRANSFERS:

FROM ASSOCIATE MEMBER TO MEMBER:

R. Dent, J. E. Fogg, F. E. George, W. Ireland, A. Mitchell, H. M. Sawyer, P. J. Shipton, J. D. Smith, R. Willis.

FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER:

R. F. S. Andrews, J. H. Bond, P. A. Broadbent, L. Brown, F. T. Graham, T. C. Greenhough, W. A. Harrison, W. G. Hucklesby, F. Johnson, J. A. Land, R. Lancaster, W. A. Mackrow, T. F. P. Smith, L. R. Targett, N. Travis, F. H. Tyler, S. A. Warwick, F. Winfield.

FROM ASSOCIATE TO ASSOCIATE MEMBER:

R. Hutcheson, L. Marshall.

FROM GRADUATE TO ASSOCIATE MEMBER:

K. C. Atkinson, A. H. A. Bastable, J. Dougall, A. D. Edwards, A. W. James, L. C. Jones, G. C. H. Lory, T. Nancarrow, G. T. Price, L. J. Rose, R. T. Sillitoe, R. Waller, G. Whittle.

FROM GRADUATE TO INTERMEDIATE ASSOCIATE MEMBER:

N. W. Jones.

FROM STUDENT TO INTERMEDIATE ASSOCIATE MEMBER:

W. J. Barber.

FROM STUDENT TO GRADUATE:

A. G. Allsop, W. H. J. Aston, M. Barker, S. S. Barton, W. J. Cartwright, A. J. Cotterill, A. W. Drabble, H. L. Faull, B. A. Gay, J. B. Gower, A. P. Lambert, G. V. Marston, F. G. McCormick, C. P. Morton, J. D. Roberts, P. H. Smith, E. Springthorpe, G. P. Tomlinson, J. F. Walsh, R. F. Wholton, G. S. Wright, G. J. Young.

SECTION ACTIVITIES

BIRMINGHAM

The first part of the 1948-49 session has been noteworthy for its large attendances at lectures. About 160 members and friends were present in December to hear Mr. H. H. Norcross, M.I.P.E., F.C.W.A., F.I.I.A., read a paper entitled " Costing as an Aid to Management." This paper stimulated a very interesting discussion. In November, another lecture was given by Dr. H. Orenstein, M.I.P.E., on " Production Practice and Research in the U.S.A." Again, about 160 were present. The Committee's policy of stimulating interest in its lectures among local firms is filling the Lecture Hall to capacity and drawing attention to the work of the Institution.

In the interest of increasing industrial productivity through improved Welding Practice and Methods, this Section is co-operating with the Birmingham Central Technical College and other Institutions in the support of three lecture discussion courses for industrial executives which are being arranged by the College. The syllabus covers Gas Welding, Arc Welding, and Resistance Welding, and lectures will be held from January to April, 1949.

Over 400 members and friends attended the Christmas Party and Dance in December. The varied dances, competitions and party games gave the function the traditional Christmas atmosphere and the Social Committee is to be congratulated and thanked for the arrangements made.

BIRMINGHAM GRADUATE

This quarter has been a very active one both for members and the Committee. Attendance at lecture meetings has, on the whole, been higher than last session and many new members have been elected.

The Graduate Section was also granted an additional representative on the Birmingham Section Committee and wish to express their thanks for the interest and support of the Senior Committee.

In October, a lecture was given by Mr. H. W. Fairbairn, A.M.I.P.E., on " Diecasting " which was well presented with slides and samples.

In November, a lecture was given by Mr. H. W. Facer, Grad.I.P.E., on " Die Cushion Equipment," which proved to be popular and instructive.

In December, a lecture was given by Mr. N. P. Watts on " Air Operated Fixtures " and would have attracted an even larger audience had it not been for bad weather. Illustrations were made by slides and a practical demonstration was made at the end.

Visits have been made to Higgs Motors, Ltd., and Walter Somers, Ltd., and those who attended gained considerably from the experience.

CALCUTTA At the first meeting of the session in November, the President, Mr. T. B. Gray, M.I.P.E., gave a stimulating address, followed by an interesting discussion. Another meeting was arranged for December, when Mr. T. R. Gupta, M.I.P.E., gave a lecture on " Manufacture of Sewing Machines in India."

Arrangements are being made to visit factories which should be of interest to the members, and these include Calcutta Port Commissioners, India Government Mint, Burn & Co., and Guest Keen Williams, Ltd.

Membership of this Section continues to increase.

CORNWALL This session has been a successful one, attendance at the October, November and December meetings averaging between 50 and 60 members.

A number of applications for membership and for transfer to a higher grade have been considered.

The lecture programme for this session is a full one and the first lecture in the New Year was on " Electronics in Industry " by Dr. J. B. Willey.

COVENTRY On the 9th October, 1948, the Coventry Section paid a very interesting visit to A. C. Wickman, Ltd. About 37 members attended and were conducted round the Powerloy and Wimet Divisions by Mr. H. Eckersley, M.I.P.E., and Mr. Williams.

The above visit was very appropriate, as the first lecture on the 15th October was on the practical application of Tungsten Carbide Cutting Tools. This took the form of an open discussion, led by Messrs. E. Eatough and H. Eckersley.

On Friday, 29th October, a Smoking Concert was attended by approximately 80 members. This was a very successful evening and the opportunity was taken to present Mr. A. W. Buckland, A.M.I.P.E., the past Section Honorary Secretary, with a small memento in appreciation of the fine service he has given to the Coventry Section.

The next lecture was on " Fabrication Applied to Light and Medium Size Components " presented by Mr. R. M. Watts. Approximately 50 members were present and heard a very instructive and interesting lecture which aroused much discussion.

COVENTRY GRADUATE In October a most enlightening and interesting lecture was given by Mr. H. M. H. Fox, M.I.P.E., on " An Outline of Die Forging Practice."

In connection with Mr. Fox's lecture, a visit was later made to Smith's Stamping Works, Coventry, where the members were able to see put into practice the various theories expressed.

The lecture which was to be given by Mr. J. V. Collier on " Boot and Shoe Manufacture (Planning) " on November 2nd, had to be cancelled, but it is hoped that this lecture may be delivered later in the session.

A lecture was given on the 14th December by Mr. J. E. Marriott on " The Production of Aluminium Houses."

DERBY

No social activities have been organised for the present session, but the Committee would like to hear from members who would be interested in taking part in an organised social function.

Three meetings have been held during the quarter, and the lectures given can be recommended to other Sections. They were " Development and Application of Resistance Welding," by Mr. C. A. Burton ; " Die Casting " by Mr. H. W. Fairbairn, A.M.I.P.E. ; and " Centreless Grinding " by Mr. H. M. Goodwin.

EASTERN COUNTRIES

For the October lecture, the Education Officer gave his paper on " The Education of the Production Engineer." A well-attended meeting welcomed Mr. Worth to the Eastern Counties. His lecture was fully appreciated and everyone enjoyed the interesting discussion which followed. It is felt that Mr. Worth's lecture has done much to create a greater interest in the work of the Institution, particularly amongst junior members. The Principal of the Ipswich School of Technology and many senior students were amongst those present.

Mr. K. E. Taylor, A.M.I.P.E., delivered a lecture in November on " Incentives to Direct and Indirect Engineering Workers," which was a great success. This subject has aroused intense interest in this area and further developments may be expected in introducing various incentive schemes of this nature.

In December the lecture was held at Colchester jointly with the Colchester Engineering Society. Mr. Hartford M. King delivered a most interesting lecture on " Material Handling," illustrated with numerous slides of various installations. For this occasion, the Committee was entertained by the Council of the Colchester Engineering Society, and is pleased to record thanks for the excellent arrangements made. This annual function has a happy social aspect which gives it an added interest.

The lecture programme of the Section has made a promising start and has created a fair amount of interest.

EDINBURGH

The lecture season was given a most excellent and inspiring start by Mr. W. C. Puckey, M.I.P.E., F.I.I.A., who read his paper on " The Gap between the Production

Engineer and the Manager" at the first meeting in October. Mr. Puckey dealt with his subject in masterly fashion, and an interesting discussion followed.

In November, the Section welcomed Miss Anne Shaw, M.A., M.I.P.E., who gave an illustrated lecture on "Motion Study" to a joint meeting with the East of Scotland Branch of the Institute of Personnel Management. The attendance at this meeting totalled 200, which is an indication of the interest shown in this subject. At the discussion following the lecture, questions were asked ranging over many aspects of the technique of Motion Study, and these were dealt with by Miss Shaw in a very able manner.

The December lecture meeting was held a little earlier than usual for the convenience of Mr. W. E. W. Dent, B.Sc., A.I.M., who read his paper on "The Selection and Application of Sand in Foundries."

In addition to the lectures, Committee meetings were held regularly each month.

A joint meeting with the Dundee Institute of Engineers was arranged for February, at which the Education Officer read his paper on "The Education of the Production Engineer."

The Chairman of Council, Mr. J. E. Hill, has kindly offered to attend a meeting in Dundee at which it is proposed to explore the possibilities of forming a Dundee Sub-Section.

GLASGOW The three meetings which have been held this Session have been well attended, and it is noted with satisfaction that a higher proportion of members than visitors have been present than during the former sessions.

The visit of the Education Officer to this district was a very full one, and the four days which he spent making a tour of the various educational and industrial establishments should be of great assistance in promoting an understanding of the Institution's activities in education.

A joint meeting was held with the Institute of Personnel Management on the 2nd December, when the views of the two bodies on "Production and the Worker" were interchanged.

HALIFAX As forecast in the last report, the "Opening Night" of the present session was a success; three members gave short papers on the subject of "The Position of the Production Engineer in Relation to National Economy," and during the discussion which followed, supper was served.

In October Dr. F. Hudson, F.I.M., of London, gave his lecture on "Precision Castings for General Engineering Purposes" illustrated by coloured films. This was well attended.

A sound film, "The Production of High Quality Steel" by Hadfields, Ltd., was shown in November, and this attracted a

large number of visitors. Mr. J. J. P. Mackenzie, of Hadfields, and Mr. J. Blakiston, M.I.P.E., a member of the Section Committee, provided answers to the many questions which were put forward.

The Section's hopes for a successful season have so far materialised, and increased attendance at all meetings has been noticeable.

The Annual Dinner Dance was held in November when the guests included the Mayor and Mayoress of Halifax ; Mr. J. E. Hill, M.I.P.E., Chairman of Council of the Institution, and Mrs. Hill ; Mr. W. C. Puckey, M.I.P.E., F.I.I.A., Vice-Chairman of Council ; Mr. W. Armstrong, M.B.E., M.I.P.E., President of the Yorkshire Section, and Mrs. Armstrong ; Captain L. J. Sarjeant and Mrs. Sarjeant ; and Major C. B. Thorne, M.C., the Director and General Secretary of the Institution, and Mrs. Thorne. The short speeches were very fitting to the occasion, and most pleasant surroundings contributed to a happy evening, which was attended by 107 members and friends.

In December the 1948 portion of the Section programme was completed, when Mr. J. Milwain, M.I.P.E., M.I.E.I., a past President and present member of the Section Committee, gave his lecture entitled " The Production and Inspection of Gears," which was extremely well illustrated by an interesting collection of slides.

The Committee has met regularly every month. There is a steady flow of applications for membership, and the Section is looking forward to confirmation from Head Office that the 200 mark has been reached.

HALIFAX GRADUATE

One lecture and one Committee meeting took place during this quarter. The original lecture, entitled " Tractor Production " by Mr. D. Bailey, A.M.I.P.E. had to be cancelled, but the Section Committee was very fortunate in obtaining the services of Mr. Turner, who very kindly gave his paper entitled " The Design of Agricultural Tractors and Implements " at very short notice. This was an excellent lecture followed by a lively discussion.

The second lecture of the session, " Production of All-Metal Bus Bodies," also had to be cancelled as the lecturer, Mr. G. L. Hart, was unable to reach Huddersfield because of fog. Mr. Hart has, however, very kindly consented to read his paper before the Section at the Huddersfield Technical College in April, 1949.

LEICESTER

As a result of the inspiring speeches made by the Director and General Secretary, Major C. B. Thorne, M.C., on the occasion of his visit to this Section on 21st October, keen interest has been aroused in the Leicester Section area, and has resulted in much greater attendances at

meetings. The Section Committee wishes to place on record its thanks to both Major Thorne and Mr. T. B. Worth, the Institution's Education Officer, for their efforts in this direction.

A well attended meeting was held in November when Mr. C. B. M. Dale, B.Sc., M.I.Mech.E., lectured on the subject of "Fabrication of Oil Engine Structures." One party of visitors and members travelled over thirty miles to hear this lecture and as a result of the enthusiasm shown, the Directors of Brush Electrical Engineering Company, Ltd., Loughborough, have invited a party of members to make a visit to their works in January, 1949, to see applications in practice of the principles described by Mr. Dale.

In December, a Joint Meeting was arranged with the Institute of Industrial Administration, Leicester Centre and Loughborough Centre, when Lt.-Col. L. Urwick, O.B.E., M.I.P.E., visited the Section to address them on the subject of "Education for Management." This address was thoroughly enjoyed by everyone and it was felt that never before had such an interesting paper been delivered to this Section.

LIVERPOOL A programme of six lectures covering a wide variety of subjects, and three Informal Discussion Meetings for members only, is arranged for the 1948-49 Session. The first of the series of Informal Discussions was held in October and was extremely well supported.

The Section was fortunate in having Mr. W. Astle to give the first lecture on "Some Applications and Limitations of Plastics."

In November, the members were shown an extremely interesting film entitled "Wheels Behind the Wheels" followed by a very informative discussion.

The second of the Informal Discussions was held in December and a joint paper was given by Mr. N. Butterfield, A.M.I.P.E., and Mr. R. W. Gardner, Stud.I.P.E., members of the Liverpool Section Committee. A very interesting discussion followed.

It has been most encouraging, since the commencement of the Liverpool Section's activities, to have numerous requests for application for membership. The present membership strength is now 127.

LONDON A joint meeting with the Plastics Institute was held in November. The title of the paper was "The Design and Manufacture of Plastic Moulds" given by Mr. E. Robinson, M.P.I., and followed by an address by Mr. J. Butler, A.M.I.Mech.E., who spoke on "Plastics Mouldings and Production Practice." There was a record attendance of over 350 members and visitors.

In December, a lecture entitled "Some Important Aspects of the Industrial Employment of the Blind" was given by Dr. L. G.

Fuchs, Ph.D. (Vienna), B.A. (London), who is himself blind. The lecture was extremely interesting and enthusiastically received, and gave a new approach to the employment of disabled persons in industry.

Several Works' Visits have been arranged for the forthcoming session.

The Section Committee has received a request for the formation of a Chelmsford Sub-Section and this matter is receiving attention.

The Committee has held regular monthly meetings. The attendance has been good and a large volume of work has been dealt with, including 151 senior and 51 junior applications for membership.

LONDON GRADUATE

A party of members visited the offices of The Daily News, Ltd., in October. A great number of members asked to be included in this visit but unfortunately only 75 per cent. of those notified were able to attend. In December, members of the Section visited E.M.I. Factories, Ltd., and were taken on a very instructive tour of many of the shops.

The lecture programme for this session consisted of " Layout for Batch Production " by Mr. W. E. Mosse, and " Training Within Industry " by Mr. R. L. Turner. Both lectures were reasonably well attended and followed by good discussions. The lecture on " Training within Industry " was of special interest as many of the members had not previously had the opportunity of discussing this important subject with a known authority.

MANCHESTER

The Dinner and Social evening held in October was a great success and the artistes provided everyone with first class entertainment.

Mr. H. Bentley's talk on the high-lights of the Machine Tool Exhibition at Olympia was extremely interesting.

In November, Mr. Lewis C. Ord gave an excellent talk on " Working Pace and Incentives." A very large, appreciative audience was present in spite of dense fog.

The two lectures held at Crewe were well received. They were " Some Practical Aspects of Gas Turbines " given by Mr. S. Rubenstein, in place of Mr. T. L. Gardner, and " Rolling Bearing Application " by Mr. R. K. Allan, M.I.P.E.

Interesting visits have been made to the British Cotton Industry Research Association ; Shirley Institute, Didsbury, Manchester ; and to Renold & Coventry Chain Co., Ltd., Didsbury, in November and October respectively. Members were very appreciative of the privilege of being allowed to visit these works and of the hospitality provided.

The Section Honorary Secretary, Mr. F. W. Cranmer, M.I.P.E., has resigned and Mr. H. E. Wheeler, A.M.I.P.E., has been appointed and took up his duties on 1st January, 1949.

MANCHESTER GRADUATE

The activities of the current session started with a visit to the Diesel Engine Works of Crossley Brothers, Ltd., where in addition to an impressive tour around the works, visitors were shown an excellent technicolour film entitled " Diesel Engines in Ships."

A lecture on " Fluorescent Lighting " was given by Mr. S. Anderson, B.Sc., in November. The lecture was illustrated by slides, and demonstrations and tests were given on an array of tubes and auxiliary fittings.

A visit to the East Lancashire Paper Mill was arranged for December.

The Committee is pleased to welcome Mr. A. Flett, Grad.I.P.E., who has been elected to replace Mr. P. Holgate, Grad.I.P.E.

MELBOURNE

The Annual General Meeting was held in October, when the Section President gave an address on the history and development of Engineering Production in Victoria.

Lecture activities are now in recess during the summer months, and will recommence in March, 1949.

NOTTINGHAM

In October, members of the Nottingham Section joined members of the Institute of Industrial Administration to hear a paper on " Valid Incentives " by Mr. E. C. Gordon England, M.I.P.E., F.R.Ae.S., M.I.E.E., F.I.I.A. This meeting was very well attended and much enjoyed.

In November, Mr. A. S. Johnstone, M.I.P.E., the retiring Section President, invested Mr. J. H. Bingham, M.I.P.E., with the badge of Office. After appropriate speeches, members listened to a talk by Mr. C. W. Wheal on " Air in Industry." This dealt chiefly with all types of air-conditioning plants and was amplified by excellent lantern slides.

The next meeting held in December was devoted to the colour film " Mechanical Handling," with a sound commentary by Mr. Neal Arden. This film, which occupies nearly two hours, deals with almost every branch of industrial handling from coal and its derivatives, ferrous and non-ferrous metals, continuous strip mills, motor car assembly, filling and labelling bottles, even to discharging passengers' luggage from the " Queen Elizabeth." In addition to a large number of members, many visitors were present and enjoyed a pleasant evening.

Applications for membership continue to be received and the membership of the Section is steadily growing.

NORTH-EASTERN GRADUATE

A meeting of the Section was held in October, when a party of members and friends visited the Dunston Power Station. The visit was most interesting and successful, and in view of the support received, it was decided to proceed with arrangements for a morning visit to the Lemington Glassworks.

On the evening of Friday, 19th November, Mr. A. J. Fellingham, Grad.I.P.E., read his paper on " Planing Machines." The lecture, which was well illustrated by slides, was followed by a very lively and entertaining discussion on the relative merits of the planing machine and its competitors in the machine world.

The next meeting of the Section is the annual Film Evening. This meeting which is invariably well attended, promises to provide an even greater attendance than usual, since it is to be a joint meeting with the local Graduate Section of the Institution of Mechanical Engineers.

N. IRELAND

A number of meetings has been arranged during this session but, as in the past, it has been found extremely difficult to obtain suitable lecturers.

A most successful lecture was delivered in January by Mr. Lewis C. Ord, in the Central Hall of the Municipal College of Technology, Belfast.

SHEFFIELD

The first Informal Meeting of the Sesssion was held in October, when means of increasing and measuring productivity were discussed. A resolution was drafted covering a plan for the establishment of an independent panel of Production Engineers to supplement the work of the established professional consultants.

A very successful lecture meeting was held in November, when Mr. S. A. Ghalib gave an interesting paper on " Electronic Control, with particular reference to Self-Regulating Systems." This was followed by a very informative discussion.

At the December meeting, Mr. G. R. Pryor, M.I.P.E., Section President, gave a short survey of recent developments arising from the work of the Anglo-American Council on Productivity, as well as a detailed exposition of the " Sheffield Plan," which arose from the October Informal Meeting.

At another meeting in December, several technical problems were introduced by the members present, and these provoked useful discussion. It is felt that the informal atmosphere at these discussion meetings can be of great value in enabling members to get together and discuss their everyday problems, and further meetings of this type have been arranged.

SOUTH AFRICA Approximately sixty members and guests were present at the October meeting at which a joint address on "Vanderbijl Engineering Corporation, Ltd." was delivered by Messrs. G. W. Raby, E. Paine, A. E. McBean and P. S. Gibbs.

Mr. W. H. Peterkin delivered a paper entitled "Materials Handling and Transporting," supported by a sound film, to the November meeting.

Mr. H. W. Mason delivered a paper entitled "Capacity Plan and Achievement" to the December Meeting.

During October some 130 members and guests visited Messrs. Vanderbijl Engineering Corporation on two separate afternoons.

During the last quarter a number of new members have been recommended for acceptance.

The Section deeply regrets to announce that on 6th November, Mr. W. J. Petersen, M.I.P.E., a member of the S.A. Sub-Council, passed away suddenly. The November General Meeting observed a two minutes' silence in respect for Mr. Petersen, whose conscientious efforts have helped to place the South African Branch on its feet.

SYDNEY During the current session, the Twelfth Annual General Meeting of the Sydney Section was held and Mr. E. L. Olfen, M.I.P.E., was elected President of the Section.

Following the Annual General Meeting, a symposium was held on "Tolerances—Finish and Fits." The symposium was opened by Mr. J. Piggott, A.M.I.P.E., followed by Mr. G. A. Gladman and concluded by Mr. N. A. Esserman, A.I.P.E. Members then took part in the discussion which followed, and the evening was voted most successful.

In October, a visit of inspection was paid to the National Standards Laboratories by members and friends and as a result of the interest aroused, another visit took place in November.

The first year of the Production Engineers Course at the Sydney Technical College has just been completed, and this course is making excellent progress. Mr. E. G. Bishop, M.I.P.E., Vice-President, very kindly donated a prize in connection with the Course, and the Education Committee is at present considering details of the basis under which the award will be made. It has been decided to call the prize "The Institution of Production Engineers, Sydney Section, E. G. Bishop Prize."

Mr. J. H. Blunt, M.I.P.E., Hon. Treasurer, will be returning from England and America in the very near future.

The Committee feels that the programme, which is already planned for the next year, will make the forthcoming session a very interesting one.

WESTERN In Bristol, two lectures have been held which were very well attended and were most interesting as well as instructive. A lecture was held at Stroud with a very good attendance, and one lecture has been held at Chippenham; although the latter did not secure as great an attendance as was hoped owing to a last-minute change because of illness, the results of the season so far have been very encouraging.

In December, the Section held its Annual Dinner when approximately 100 members and friends participated in a very enjoyable evening. The Section was honoured with the presence of the President of the Institution, Dr. H. Schofield, C.B.E., who responded to the toast of the Institution, and gave a very interesting résumé of the Institution's activities and the efforts being made to bring to the notice of the nation the work which is being done by Production Engineers, and also the assistance which could be rendered to the Government by members of the I.P.E.

Other distinguished visitors were Mr. N. Rowbotham, C.B.E., M.I.P.E., Past President; Mr. J. Mackenzie, Chairman of the Bristol Engineering Manufacturers' Association; Capt. C. F. Uwins, President of the Bristol Branch of the Royal Aeronautical Society; Major C. B. Thorne, M.C., the Director and General Secretary of the Institution.

The Education Officer visited the Section early in the New Year when he gave a lecture to the Western Section members. In addition, a full programme covering three days was arranged for him to visit various firms and Education Authorities in the district.

WEST WALES The session was opened with a film lent to the Sub-Section by Messrs. Hadfields on the "Production of High Quality Steel," followed by open discussions on "Training for Foremanship" and "Management and the Production Engineer." This was followed by a lecture and visit to the Metal Box Company's Works, Neath.

Three Committee meetings were held which satisfactorily dealt with the arrangements for lectures together with other matters. Very interesting contacts continue to be made in the area, and judging from the results of the lectures given, there is every reason to believe that the Sub-Section is well established.

It is particularly gratifying to know that at each one of the meetings there has been an attendance of between 60 and 80, and this has done much to encourage the Committee.

WOLVERHAMPTON In September, Mr. S. A. Ghalib gave a lecture on "Electronics in the Service of the Engineer." In October, Dr. Singer gave a lecture on "Metallurgy and its Importance to the Production

Engineer," and in November, Mr. B. H. Dyson, M.I.P.E., delivered his paper on " Production Engineering in Relation to the National Economy."

These lectures were attended by about 60 members and visitors. They were very enlightening and valuable to those present and were followed by most useful discussions.

It is regretted that one of the Committee's most valuable members, Dr. W. A. J. Chapman, M.I.P.E., has had to resign from the Section, as he is taking up a new appointment in the South.

Applications for membership continue to be satisfactory.

WOLVERHAMPTON GRADUATE

In October, a lecture was given at Wolverhampton on " Hydraulics and Pneumatics in Aircraft " by Mr. S. R. Tyler, Grad.I.P.E., which was of great interest, especially to the local workpeople. Two well-arranged and interesting visits were also made to the Austin Motor Company.

In November a lecture was given at Dudley on " Heavy Forging Plant " by Mr. A. H. Bennett. The attendance was good and the lecture was very well illustrated. Two films on the subject were shown. A visit was made to E. P. Jenks, Ltd., Wolverhampton, in connection with brass tap and strip production.

A lecture on " Electronics in Industry " was delivered at Wolverhampton in December and a visit to the B.B.C. Studio in Birmingham is being arranged.

Three Committee meetings and one Sub-Committee meeting have been held during the quarter. The Section Committee has shown great enthusiasm and has been very active. An Advertising Secretary has now been appointed and a discussion group has been formed to hold monthly meetings.

Members of the Section are now being invited to attend Committee Meetings as spectators. In this way they gain an insight into the work, which would be useful to them if they were in the future elected to serve on the Committee.

YORKSHIRE

During this session three lecture meetings have been held. The first was on " Production Research Development in America " by Dr. H. Orenstein, M.I.P.E., in October, and in November, Lt.-Col. C. W. Mustill, M.B.E., M.I.P.E., delivered a lecture on " Management." In December, the Education Officer, Mr. T. B. Worth, was scheduled to give his lecture on " The Education of the Production Engineer." Unfortunately, owing to unforeseen circumstances, Mr. Worth was unable to attend and his paper was read by Mr. H. C. Newell, M.I.P.E.

YORKSHIRE GRADUATE

In October a visit was paid to R. W. Crabtree & Sons, Ltd., Leeds, which proved to be of great interest to the members, especially in view of the fact that many new machines had been installed by this firm.

In November, Mr. J. H. Smith, F.S.A.A., F.C.I.S., read his paper on " Costing for the Smaller Engineering Firms " at the Midland Hotel, Bradford. The attendance was exceptionally good for a Bradford meeting. Mr. Smith dealt admirably with his subject, supplying a number of forms which illustrated his lecture more clearly.

Later in November, Dr. W. A. Tuplin, M.I.Mech.E., read his paper on " Fundamentals of Gears " at the Great Northern Hotel, Leeds. Dr. Tuplin's paper was interesting and instructive in its simplicity, and it served a good purpose in refreshing the memories of those present.

STEEL PRODUCTION — SOME FACTS AND PROBLEMS

by L. CHAPMAN *

Abstracted from an address given to the Sheffield Section of the Institution, October 6th, 1948.

Mr. Chapman opened his address by emphasising that the whole future of this country depends on efficiency and low cost of production of high quality goods. He then went on to describe in sequence the magnitude and nature of the problems of the steel industry.

The two biggest steel-producing areas of the country are South Wales and the North-East Coast, which together produce about 42 per cent. of the country's total in roughly equal amounts. Scotland and Sheffield come next with about 28 per cent. of the total between them, again in roughly equal amounts. Lancashire and Lincolnshire come next with about 18 per cent. of the total between them. The location of the qualities and types does not, of course, follow this pattern. Open hearth steel, both acid and basic, is widely distributed in its make over the whole country.

In the case, however, of special steels of high grade quality of alloy type made mainly in the electric furnace, about 60 per cent. of the total of the country is made in Sheffield and district, together with one works in Manchester ; as regards tool and high speed steels, these come almost wholly from Sheffield and one works in Manchester.

Just to indicate the range and complexity of what is generally referred to as " Steel," consider the comparison between bulk steel as used for concrete reinforcing bars on the one hand, and high strength high temperature steels as used for vital parts of jet engines on the other. The jet engine steels contain 50 per cent. or more of complex alloys, as many as ten different kinds of alloys in some cases being combined together to give the properties of strength at temperatures without which jet engines (in which this country is supreme) would not have been possible.

Perhaps it is difficult to capture the imagination and to convey a mind picture of what jet engine steels really have to do, but just consider the fact that these steels form the moving parts rotating at speeds up to 20,000 revs. per min. at a bright red heat between, say, 700°C. and 800°C. Jet engine steels to operate under these conditions must be 100 times stronger than ordinary steels. To have this strength at high temperature they must obviously be

* *Managing Director*, William Jessop & Sons, Ltd., Sheffield.

The Institution of Production Engineers does not accept responsibility for any statements made or opinions expressed in any papers published in the Journal of the Institution.

almost undeformable and yet they have to be manipulated because they have to be produced as forgings. These forgings have to be of uniform physical properties and absolutely free from internal ruptures of even the smallest size, otherwise there would be the grave risk of failure and loss of engine, aircraft, pilot and passengers.

RAW MATERIALS

Scrap has its origin partly in circulating scrap in the steelworks; another source is returns from steel users and here, if I might make a little propaganda, may I say that a more rapid turn round and return of scrap would be invaluable at the present time. Before the war the steel industry regularly imported scrap from America and elsewhere. Today, pre-war traditional markets are closed, as those countries want the material themselves. Our hope today is Germany where there are huge quantities; although it has not been easy to get it, hopes are rising.

IRON ORE

Iron ore is the basic material of both iron and steel. It is a natural product found in the earth and is produced just like coal, either by open cast working or deep mining. It never occurs as metallic iron and has first of all to be smelted in a blast furnace before the contained iron is available for conversion into steel.

The iron content can vary from 20 to 70 per cent., the silica from under 1 up to 26 per cent., and the phosphorus is also very variable. Generally speaking, the main characteristics of an ore in any mine do not vary very considerably, with perhaps the exception of the huge deposits in Lapland, Sweden.

Apart from deposits in Cumberland and Glamorganshire, which unfortunately are a diminishing factor, the iron ore remaining in the U.K. is relatively low grade. At the same time, it is well to remember that during the war the iron and steel industry met the ever-increasing demands for steel by expanding the production of home ore to fill the gap caused by the very much reduced quantities of imported ore available.

Against a normal consumption pre-war of about 11/12,000,000 tons of home ore and 5/6,000,000 tons of high grade foreign ore, the import of the latter fell as a result of enemy action to 1½/2,000,000 tons per annum. The slack, however, was taken up by home ore production, which reached in 1942 the record figure of 20,000,000 tons.

Since the cessation of hostilities in 1945 the tremendous demand for iron and steel, coupled with the terrific increase in the cost of coke, has emphasised more and more the desirability of importing the maximum tonnage of rich ore to boost the output of the existing

blast furnaces. It will be appreciated that it does not take any more coke to smelt a ton of imported high grade ore than a ton of low grade home ironstone. It follows that with the same amount of coke the production of the blast furnace is increased appreciably.

Unfortunately the same conditions also apply in other European countries, with the result that the demand for these rich ores has spread and shows signs of outstripping the available supplies, especially as many of the producing mines have not as yet fully recovered from the effect of enemy action during the war years.

In 1948 the British steel industry will have had to organise the purchase, shipping, unloading and distribution of some 9 million tons of imported foreign ore from Sweden, French North Africa and French Morocco, France and a few other places. This is between 2 and 3 million tons more than has been brought in during any one year in the last thirty years. In order to achieve this volume it has been necessary to purchase practically every available ore within a reasonable distance from the U.K. The number of different qualities is very considerable, being approximately 60.

Enough has, I hope, been said to show that the problem of adequate supplies of iron ore is in itself a colossal commercial and technical one, requiring knowledge and experience that cannot possibly exist anywhere outside the industry concerned with the use of the material.

Manganese ore has for long periods come from India, and a crisis had to be met when internal disruption of transport suddenly found the trains and the ore in one country and the drivers of the locos in another, and it appeared as though they might never meet.

Certain refractories or ingredients for refractories and furnace linings have to come from Austria and Czecho-Slovakia to supplement home supplies. Ferro-chrome comes from South Africa, Rhodesia and West Africa. Nickel almost entirely comes from Canada, and molybdenum from America. Vanadium-containing ores are mainly South African and refined in this country.

Tungsten is now entirely refined in this country from wolfram ores purchased in Burma, China, Portugal, Bolivia, Canada, Argentine and many other places. It is perhaps interesting to recall that in August, 1914, virtually no tungsten was refined in England and all our supplies came from Germany. Within a few months the British special steels industry, all being firms in Sheffield, combined to erect and start up a tungsten refining plant at Widnes. Ever since 1914 these works have continued to operate and have been extended, and along with other main British tungsten refineries, they meet the whole demand for tungsten in every form, not only for the steel industry but for fine chemicals, lamp wire and every other purpose.

TONNAGE OF MAIN RAW MATERIALS

Using as a basis an estimated production of 15 million tons of ingot steel, and taking only iron ore, coal, coke, pig iron, scrap and refractories, the tonnage volume needed for this programme can now be examined. The ratio of pig iron to scrap is not fixed ; it can and must vary as circumstances require, and the industry must be flexible and adapt itself to availability of supplies. Again, the type of steel demanded at any time affects the balance of pig iron and scrap. The possibility of feeding " hot metal " in some cases into the steel furnaces as against " cold " affects the issue. Therefore, there is nothing static in the problem and tonnages of various raw materials are changing constantly.

The type of ore available affects the situation as, for instance, whether it is high quality imported ore with a high iron content or lower grade home ore. However, assuming that pig iron availability results from say, about 9 million tons of high grade imported iron ore and the balance home mined lower grade ironstone, and that the ratio of pig iron to scrap used in the steel furnaces is 50 per cent. pig to 60 per cent. scrap (remember a furnace charge is about 108 weight for each 100 of ingots cast owing to slag and melting losses) the following figures emerge :

There would be required :—

8·5 million tons of scrap.

9·5 million tons of pig iron, which includes foundry iron for ancillary purposes including ingot moulds and many other requirements.

9·0 million tons of imported ore which is about the limit to be expected from foreign sources.

13·0 million tons of home iron ore.

12·0 million tons of coke for making pig iron, etc.

14·0 million tons of coal for making coke.

7·0 million tons of coal for direct use in steelworks.

1·0 million tons of refractories.

This gives an approximate total of 74 million tons of main raw materials.

No tonnage of materials has been included for alloys, oxides, fluxes, fluorspar, fettling of furnaces, yet the figures given have reached 74 million tons without counting the tonnage of steel resulting from those materials. Therefore, taking into account the product, whether in ingot tons or in finished steel, it can be said that the steel industry needs almost 100 million tons of transport a year *if* everything moved forward on a straight line and did not require handling more than once.

INDUSTRY ORGANISATION

A brief explanation of the present structure of the organisation will now be given. Every section of the industry is organised through Associations which are combined into groups called " Conferences", and it is those " Conferences " which join up with the central body known as the British Iron and Steel Federation.

There are 13 Sectional Conferences commencing with producers of pig iron, leading on to ingot producers ; sheet and tinplate ; bolt, nut, screw and rivet ; tube ; wire and wire rod ; heavy forgings and tyres ; alloy steel and stainless steel and crucible and H.S.S. and light rolled steel. Through these Conferences every section of the industry plays its part in Federation policy.

There is also the industry central research known as B.I.S.R.A. (British Iron and Steel Research Association) which will be mentioned later.

An iron ore company purchases and distributes all imported iron ore. Certain ferro-alloys such as manganese, silicon and ferro-chrome are bought and distributed centrally, thereby ensuring the best negotiating power in purchasing, and collaboration with the Government on currency.

The Development Committee of the Federation deals with every proposed major development scheme before it is considered by the Iron and Steel Board (now deceased), the latter of course being responsible to the Government. Committees of technical, practical and commercial men from every section of industry deal with such diverse problems as raw materials, coal and coke, production and supplies, exports, transport, public relations, prices and costs, recruitment and training, statistics, wages and working conditions, tariffs, and collaboration with main steel users such as the motor industry. The magnitude of the voluntary work of these can be appreciated when it is realised that there exist about 20 different Committees, most of which must meet at least once every month.

The policy controlling the *distribution* of the product that comes out of this colossal co-operative effort emanates from Government direction and decision, and all who are steel users must be familiar with " Distribution Schemes."

CO-OPERATIVE RESEARCH

One problem that the steel industry has had to face is the organisation of scientific research while productive resources are at full stretch. In such circumstances a certain amount of rationalisation of research has been desirable in order to pool available resources and to avoid wasteful overlapping and duplication, while over-centralisation has also had to be avoided, to retain the benefits of private initiative and competition.

This problem is by no means peculiar to the steel industry,

which is in company with some thirty other industries in adopting the method of co-operative research through a Research Association. The British Iron and Steel Research Association, or B.I.S.R.A., was formed by the industry in 1945 and receives annual contributions totalling some £250,000 from its members, supplemented by a Government grant through the Department of Scientific and Industrial Research. In this way B.I.S.R.A. is linked with the National Physical Laboratory and all the other Research Associations, many of which, such as those concerned with the Cast Iron, Non-Ferrous Metals, Welding and Refractories industries, work in related fields.

Through B.I.S.R.A. the members initiate and co-operatively carry out scientific research beyond the powers of or inappropriate to the resources of individual firms. Much of this work can be described as " background " research, defined by Sir Edward Appleton as " fundamental research in specific fields for ultimate application." This provides a bridge between the academic researches for which this country has long had so fine a reputation and their industrial application in which we have not always been so prominent. Operational research also plays its part in this connection.

About one-third of B.I.S.R.A's work is carried on in the works and laboratories of member firms, a similar proportion at B.I.S.R.A's own laboratories or experimental plant, or by other Research Associations or the N.P.L. and the remaining third is farmed out to Universities or other academic bodies where the bulk of the fundamental or ".purely " scientific work is done. Results are, of course, freely available to all the Association's members and are mostly published openly in due course through the Journal of the Iron and Steel Institute. B.I.S.R.A's activities are controlled by a Council appointed by the industry through the Federation and the Iron and Steel Institute and the Department of Scientific and Industrial Research is also represented. The detailed research projects, and there are nearly 400 in hand at the present moment, are supervised by a series of voluntary committees drawn from eminent scientific and industrial personalities throughout the country, and organised into appropriate divisions and departments, each almost autonomous in function and finance. Permanent scientific staff of B.I.S.R.A. number about 200 persons under Sir Charles Goodeve, F.R.S., and there are six B.I.S.R.A. research stations including experimental blast, open hearth and electric furnaces and a rolling mill.

PRICES OF STEEL

Pre-war it was the responsibility of the Import Duties Advisory Committee to satisfy themselves and the country on steel prices. Records of the Public Accounts Committee and the Select Committee on National

Expenditure have shown that this matter of steel prices has at times been under microscopical examination. No "cost plus" basis where the higher the cost the higher the profit was allowed in this industry.

Inevitably uniform prices for the same quality in the same form was essential, and supervised costing and price fixing by the Iron and Steel Board, a Government established body, was enforced.

Regular cost information has to be submitted by every section of the industry. In addition a most highly qualified Financial Adviser to the Iron and Steel Board, who is again appointed by the Government, obtains direct from *every* costed firm a statement showing its total profits over the whole of that firm's activities even where, as steelmakers, they are also engaged in lines outside the direct range of steel manufacturers. All periodic cost returns have finally to reconcile with the final outcome of the firm's earnings. Prices are fixed by the Iron and Steel Board as a result of cost information so obtained. These prices leave little or no profit to the semi-efficient producer and a loss to the inefficient, consequently the inducement all the time is towards efficiency.

A brief examination may now be made of the result of comparing British prices of steel with coal and with industrial materials and manufactured goods generally, and then comparing British steel prices with those of a few other countries.

Prices of finished steel generally are just under 170 against 100 in 1938, but coal, which is one vital material in the cost of steel production, is 240 against 100 for 1938, and industrial material and manufactures generally are over 230 against 100 in 1938. Those figures show the effect on steel prices of increased productivity and increased efficiency when set against the prices of manufactures generally.

Next to Australia, the U.K. is in most lines still the world's cheapest producer of steel. Comparing British steel prices with other countries, but excluding any comparison with Australia, and taking countries representing about 80 per cent. of the world steel production (incidentally the United Kingdom produces between 9 and 10 per cent. of the total world steel production), the following summarises the position of certain main types of products.

(*a*) *Angles, Joists and Plates* are cheaper in this country than in any of the other countries.

(*b*) *Rails* of standard size are cheaper here than in any country.

(*c*) 3½ *per cent. Nickel steel* is cheaper here than in America.

(*d*) *Billets for re-rolling* are cheaper here than in every other country except America, where prices are slightly lower than in the U.K.

(*e*) *Heavy bars, re-rolled bars and hot-rolled strip* are cheaper in this country than in any of the other countries except Czecho-Slovakia, where the nationalised steel industry is run at a heavy loss paid by the State.

(*f*) *Sheets of 20G.* are cheaper only in America and South Africa.

(*g*) *Tin Plate* is cheaper only in America.

The so-called " subsidy " to steel is in the main the measure of the difference in price of imported steel. It would not exist if foreign steel brought into this country was not more expensive than its British counterpart.

That is the achievement of an industry stagnated as regards modernisation during six years of war, and now rapidly modernising but still far from having finished. It is suggested that when all its plans are completed, the picture will be still more favourable for the British steel consumer.

As regards Australia, which was excluded from the comparison, steel in that country is, in the main, considerably cheaper than in the U.K. The reason is not far to seek. Coal in Australia is less than half the price of British coal. Iron ore of high quality exists in abundance, obtainable at a small part of the cost of our imported good quality ore. With those two basic raw materials at such prices, Australian steel costs are inevitably cheaper than British and cheaper than in America, South Africa, Canada, Belgium, or anywhere else.

But according to a recent reported statement of the Chairman of the biggest steel producers in Australia, it is to be expected that Australian steel prices will advance. They are working in Australia substantially below capacity due to severely restricted supplies of coal and shortage in manpower, the latter accentuated by the operation of the 40-hour week.

CONCLUSION The total value of steel produced in this country certainly exceeds £300 million. The industry employs nearly 500,000 people, including craftsmen of the highest order, metallurgists, physicists, scientists of every grade, clerical workers, commercial men, and many others, most of whom have been brought up in the industry.

The industry is developing as rapidly as it can ; huge schemes are being carried out in South Wales, on the N.E. coast, Scotland and elsewhere. The City of Sheffield has spent millions on its special steels' works, not merely now, not only during the war, but for years before the war. Both national recovery and the safety of this great nation depend on steel. The policy followed by the industry itself or by the State can make both secure or put both in jeopardy. Maybe engineers, as steel users, can judge from what has been said whether the industry is doing its best to contribute to recovery and security.

THE PRODUCTION ENGINEER IN RELATION TO NATIONAL ECONOMY

by B. H. DYSON, M.I.P.E., F.I.I.A. *

Presented to the Wolverhampton Section of the Institution, November 3rd, 1948.

If we ask, " What is the problem of our national economy ? " the large majority of people will immediately recite the worn out phrase : " More production and greater exports."

Let us just review the economy of national production requirements from 1940 to date.

THE WAR YEARS

From 1940 to 1945 our national survival depended on an ever increasing production of aircraft, tanks, guns, etc., and materials, machines and labour were massed to this effort, regardless of cost. Managers were besieged by Ministry officials pleading for more and with repeat orders. High wages and ensured profits were then the order of the day.

As a nation we were rightly proud of our production achievements, and by the concentration of management and every available man and woman engaged on the productive effort, we realised our objective. But remember, as a nation, our economy went to the wall. We did not have to depend on the exchange of goods from other countries, and our exports were cut by 70 per cent. and our civilian consumption of goods by 21 per cent.

From 1945 to 1947, home and overseas demands for goods were so colossal that production was sheltered from competition. The demand was for more production to meet the export drive, regardless of cost and sometimes even quality.

Possibly it was natural that this should cause us to behave as though we were no longer business men and merchants, but purely a productive unit with the luck to be free from competition.

PRESENT DAY POSITION

In 1948 many still have the impression that we have only to produce more in order to overcome our difficulties. The real business man, however, knows that the buyers' market is already here, and that paramount to all else is the state of his order book. In other words :—

FIRST we had THE COURTSHIP PERIOD—the Production Engineers' dream of large scale production at any price.

SECONDLY we had THE HONEYMOON PERIOD—the Sales Managers' dream of overflowing order books of the sellers' market.

* *Works Manager*, Hoover, Ltd., Perivale.

NOW we are faced with the reality of MARRIED LIFE— the realisation that two cannot live as cheaply as one, and that as three or four come along to fill the four-wheeled matrimonial fruit basket, the overheads go up and the buyers' market is with us.

We have to remind ourselves that Britain rose to be the greatest industrial nation as traders and as keen business men. To recapture and hold our markets will demand commercial genius, competitive spirit, and in fact, very much more than just increased production.

THE REAL CHALLENGE

Is the problem one of higher wages, lower profits, shorter hours, more incentives, restrictive practices, labour saving, starving people into jobs, feeding people into jobs, lower taxes, cradle to grave, social security, or visiting and consulting America ?

Let us review a few familiar statements :—

BRITISH ZEAL

It is said that the British workman does not work with the same zeal as he did before the war. Some say, " If we could only get people to work as they did during the war—like the pilots in the Battle of Britain, like the men at Alamein and Arnhem, like they did after Dunkirk—things would be different."

But these statements are references to one and the same people—we cannot praise men one day and condemn them the next. Remember, it is a fact that time lost through strikes and stoppages at the end of World War 2 was less than one-twentieth of that experienced after World War 1.

BRITISH CRAFTSMANSHIP

Again, we hear that the British workman has no pride of craftsmanship or interest in the quality of his work. Yet we are proud to say British trade and industry was built up to the highest in the world by the skill of its craftsmen and the quality of its products.

Once more, these are references to one and the same people.

NATIONALISATION OF INDUSTRY

We hear it said that nationalisation of industry is the cause of the trouble and that private enterprise is the answer to the achievement of success. Don't forget, however, that the Bankruptcy Courts record failures of certain private enterprises, and we well know of the regularity of announcements of losses in nationalised efforts. It is *individual* enterprise we require both in State and in industry.

What is our problem child ? It has been said, " There are no problem children, only problem parents," and surely we would accept the challenge that our Institution is the parent of production.

I believe the most disastrous element in our national economy to-day is our acceptance of the lowering of our standard of expectancy. We are too willing to think conditions are against us and that we cannot do much ourselves. We are pleased to think it is the other fellow who must do something.

I therefore want to deal with the problem under five headings :—

(1) Who sets the standard of expectancy ?
(2) From whom do we expect higher industrial efficiency ?
(3) Production Management and National Economy.
(4) Production Engineering and National Economy.
(5) Creating the desire for industrial prosperity.

THE STANDARD OF EXPECTANCY

On the question of national standards, how can we possibly talk about a higher standard of living, and at the same time have a low standard of expectancy ?

Many of you will remember the recent Olympic Games. Who set the standard of expectancy for the various events—surely the previous Olympiad and the world records ? Who has set the standard of expectancy in air speeds—surely the recent achievement of 760 miles per hour set up by a British aircraft pilot ?

In other words, it is the *individual* who sets out to achieve something higher than that previously attained, and thereby creates a target for others. Consider the standard of expectancy of surface finish and dimensional accuracy—most of you will remember the time when working to ·0001 in. was considered to be the acme of perfection, but Production Engineers now talk of working to it.

Who sets the standard of expectancy for industry ? Are we content to let American experts do it for us ? Are we content to let Government departments set it at " ten per cent. more production ? " No, this is our responsibility as individuals, as industrialists and as members of the Institution of Production Engineers.

In fact, our first responsibility is to raise our standards of Production Management and Production Engineering. Do we know in our own industries, in our own companies, how we compare with others ? Do we know the trend of productive efficiency and how we line up with the average ? Where are our national industrial standards to indicate where our target is ? What a pioneer job this Institution of Production Engineers could do in preparing such a survey and statistics !

With no goal posts there can be no goals ; with no winning post there can be no race ; with no standards of expectancy for the individuals and departments in your organisation, there can be no measurable efficiency.

Are you satisfied that your workpeople knew when they left the factory or office this evening what they had achieved against your expectations? It should be borne in mind that a nationally stated target of 10 per cent. more—or any other wide statement—means nothing to Joe who operates the capstan, or Bill who jig bores the fixture, or George who issues the raw materials, or Mary who keeps the stock records.

By setting standards of expectancy, we have in my company achieved considerable increase in efficiency. For instance, in one factory the production achieved as against the schedule set was 97·8 per cent. for 1947, and for the first six months of 1948 was 100·51 per cent. Pre-war scrap was 3·8 per cent. of Factory Standard Cost with a target set at 2 per cent.; results for the first six months of this year are 1·67 per cent. Direct productive hour efficiency is 16 per cent. higher than the best pre-war standard.

Organisations are in many respects like individuals. One resemblance is their sensitivity and reaction to environment. Often persons of considerable potential capacity tend to deteriorate when conditions and circumstances are such that there is no challenge to put forward their best. Under the shelter of full order books, assured profits and a sellers' market, many organisations have lacked the standard of expectancy that stiff competition sets.

HIGHER INDUSTRIAL EFFICIENCY

If the statistics of the distribution of manpower in Great Britain are reviewed, it will be found that out of a total working population of about twenty millions, approximately eight millions are engaged in the productive industries. Also if the payroll of a range of industrial organisations is reviewed, it will be discovered that the percentage of direct producing personnel is invariably only 50 to 60 per cent. of the total employed. This reduces our national figure of direct producers to approximately four million, and therefore if it is only to the man or woman at the production machine or bench that we are shouting slogans and pasting posters for higher efficiency, then we have to think again.

One of the wartime ills from which British industry is suffering is the disease of overheads. I venture to suggest that your cost of overheads is the highest portion of your factory cost.

The chief reason for our rise in industrial overheads is the lack of standards of expectancy. While we have used analytic motion study and the measuring tool of time study on the machine controlled factory job and the simple assembly operation, we have

ignored the operation of our stock control records, our material handling in the Goods Receiving department, or even the potato peeling in the canteen kitchen.

On the production job the tools, gauges, materials and drawings are supplied to the production operator, but the toolmaker still hangs round the Stores' windows.

If an assembly foreman wants to engage a young lad on his assembly line, he will be reminded if he is already using more hours than he should for the job. If, however, the Toolroom Foreman engages another tool fitter or the Purchasing Manager engages another buyer, no one turns a hair. What sort of industrial efficiency is it that nets the small fry and passes up the big fish? No wonder the little girl on the sub-assembly bench, when approached by a motion study expert, exclaims, "Why pick on me?"

Many companies employ quite a sizable Progress Department to keep historic records of how the production job is staggering through the factory, or have elaborate work loading charts to illustrate how far behind the delivery date the order will be, or machine loading graphs showing the capacity and commitments of the work load. But invariably the maintaining of the delivery date will depend on the materials, tools and gauges being available. Yet how many of us know the work load on our Purchasing Department, the Tool Drawing Office, Toolroom or Inspection Department? Consider the repetition job of the Storekeeper selecting components from the Stores bin ready for issue to the assembly department. I wonder how many companies, considering themselves efficient, have even troubled to find out how many selections the Storekeeper should average per hour. How do you decide the number of Storekeepers you require, or that your direct operators can support?

In other words, it is no use forgetting the ninety and nine indirects and rejoicing in the one direct producer actually found on the job. A standard of efficiency must be set for everyone in industry.

One of the best ways of controlling and setting a standard of achievement of indirect departments is by financial budgets. By this method one company has increased the efficiency of its indirect departments by 24·16 per cent.

An example was the amalgamation of its Stores, Receiving, Progress Planning and Works Order sections under one Superintendent. After reviewing, modifying and co-ordinating the functions of these departments, one recording system of stock control replaced two previous records and eliminated stores bin

cards. This resulted in a more efficient service, reducing the indirect personnel by 11 per cent. and reducing the cost of running the department by £6,000 per annum.

The amalgamation of departments is one of the best ways to overcome duplication of records and functions to prevent Empire building of indirect departments.

PRODUCTION MANAGEMENT AND NATIONAL ECONOMY

Perhaps you have not used the statements that reasons for lack of productivity and national economic failures are either Government control, shortages of labour, or material shortages, but you may have heard others state these reasons.

While I agree that you would have a queer appetite if you liked the taste of all the things Government offices dish up, I believe that, just like the doctor's unpalatable medicine, some of it is good for us. I believe that management is in danger of leaving industrial problems to the Government, and hiding behind the issuing or non-issuing of licences, allocations, etc.

There is a lot of nonsense about shortage of labour—in fact, if you review your indirect departments you will possibly, like me, come to the conclusion that you have hoards of labour. Have you ever gone out of your office and stood for ten minutes in those departments which have no time standard and control? How many are actually doing a job of work? Have you ever watched on a road repair job, or on a railway station, for the same thing? My estimate is that at any one time, only about 70 per cent. are actually working. No, we may have a wrong distribution of labour, but certainly no shortage.

On material shortages, I suppose each one of us that looks at the average factory scrap pile, or our production methods that discard as much material as is used; or reviews the redundant material cluttering up the Stores, can see some reason why there are material shortages.

Perhaps some of you will agree with me that those problems which are actually affecting our national economy are lack of leadership, slavishness to tradition and industrial waste. I believe these are production management's problems in relation to national economy.

The majority of people are led into action—in fact, people like a leader and will respect and follow good leadership. If the official leader fails, then an unofficial leader, whether he be the Personnel Manager, Shop Steward, or the noisy agitator, will soon influence the working group. Leadership has been defined as the art of being able to get people to express more ability in action than they are aware of having in reserve. Note the word "art"—not to be confused with "artfulness."

What are we doing about the correct selection and training of leaders? In my opinion we have neglected the need for technical training and are in danger of having managers who lack the technological ability to understand and ask the right questions in order to control effectively.

In my own organisation we have, over the past ten years, cast our net much wider than is normally done, and have a definite policy of promoting and inter-changing supervision from department to department, in order to develop leadership qualities. Do not be afraid to take a chance with a promising young fellow say from the Cost Office, the Tool Drawing Office or the Tool Room and put him in charge of a department. We have been surprised at some of the good material we have found from unexpected sources.

Do you remember what was said of the one time unheard of soldier?—" Who is this fellow Montgomery? " " What experience has he had? " We said that of a Spot Welding Operator who is now in charge of a Production Engineering Department; of a Tool Designer who is now an Assistant Works Manager; a milkman who is now a Section Leader of a Press Section; a coal miner who is an Assembly Foreman; a cost clerk who is now a Superintendent in charge of Stores, Receiving and Despatch and Progress Control.

I would make it quite clear that considerable training has been done in each case, including courses outside the company, such as the Staff Administrative Colleges. One word of warning in training ambitious men—see that they have a chance to develop and are not frustrated. In fact, I believe that just as it is necessary to cut out the dead wood and prune a tree before grafting on new wood, so it is necessary with introducing new leadership. This often demands considerable courage, and is therefore so often neglected.

Another thing to remember is that if you want a man who can jump a six-foot obstacle, it is no good having one who can jump five feet and think that by getting another man who can jump three feet to help him you will achieve your objective.

Again, I believe we are in danger of spoon-feeding our young engineers and potential managers. Do we ever question what effective results they put into practice as a result of reading the technical journals we supply? Do we ask if they ever contribute to this dissemination of knowledge? Do we expect them to come back from a Machine Tool Exhibition or a Bournemouth Conference and put into practice what they have learned—or do we accept it as just an outing?

TRADITION

A few words on tradition—it is a fine thing if used as a good background and not as a forward policy. Antiquity is not a voucher for efficiency, and many a false step is made by standing still. We often hear comments on restrictive practices. I believe many management restrictive practices are cloaked under tradition.

Let us consider one or two examples. If you have two dozen angle iron frames to make and paint, you will expect them to be spray painted. Yet if your Plant Department makes up two dozen angle iron bench legs they will hand-brush paint them—because of tradition.

Again, under one Inspection Foreman a job of selecting and packing certain components just cannot be motion studied and a time standard set, because tradition says you must not investigate the work of inspectors. Yet another Inspection Foreman proves that by a correct sequence and layout, he can work to a time standard and reduce the possibility of errors.

Take the job of office and factory cleaning—one foreman will insist on the traditional broom and dust pan, the scullery brush and mop, yet another foreman will really set out to mechanise this job of cleaning—will go out and see how other firms do their industrial cleaning, and will call in the time study engineer to give him the economics of mechanised cleaning equipment.

INDUSTRIAL WASTE

On the question of industrial waste, first of all I would venture to suggest that to-day many companies are suffering from excessive stocks—in some cases excessive stocks of finished goods, but in many others of excessive stocks of raw materials, work in progress and redundant materials and tools. In fact, some companies are in financial difficulties due to this problem. Surely this is a question of national economy for which the Production Manager is partially responsible ?

Do we as Production Managers know the quantity and value of the material stocks we hold in relation to our productivity and turnover ? Do we know if the value of our work in process is in ratio to our business—or even if it is higher or lower than pre-war, or our 1947 figures ?

It is questionable if there need be any shortage of iron scrap if every Production Manager had a genuine survey and cleaned out all the iron scrap around and inside his factory. How many companies have had a detailed check up and sort out of all the surplus and redundant materials and equipment, and excessive stocks of indirect material and small tools, accumulated during the war period ?

PRODUCTION ENGINEERING AND NATIONAL ECONOMY

Having appreciated that often only 50 to 60 per cent. of the people in industry are directly employed on production, and that direct labour costs are often only 20 to 40 per cent. of the total costs, it would appear that production engineers must accept the responsibility of engineering production—of much more than just machining and assembly operations.

Let us review some of these important services whose only effective function is to assist production effort.

How much of industrial paper work has to be actually engineered to the job required? Have you ever checked up on the number of forms, and the time taken to fill them in, that are necessary in your organisation to interpret the customer's order from its inception to the final despatch of the goods? Consider even the work involved in a Production Engineering Department—is there any semblance of production flow from the process Planning Engineer to the Tool Designer; to Tool Draughtsman; to Time Study Engineer; to Material Ordering; to Works Order issuing—or are each of these water-tight sections, possibly even in separate offices?

Some time ago we reviewed the number of different forms necessary to obtain service from various departments, and found they were six in number. After re-designing, however, one only is now used, no matter what service is required. So often even in a well-equipped production factory we find Tool Drawing Offices and Planning Departments without the simple adding or calculating machines.

When our Tool Designers are handed a component to tool up, do we indicate the cost we are prepared to expend or the operating time required for completion of the job? Do our Tool Designers and Toolmakers know the comparative times of locating a blank in a forming tool; do they know the locating, loading, swarf cleaning and unloading times of the various types of jigs and fixtures? How many jigs and fixtures are designed to synchronise the use of both hands and incorporate blind approach location for both component and fixture?

We sometimes hear of a supposed restrictive practice of workpeople not being willing to operate more than one machine, but do we position machines in order that this is a proposition? Just as important, do our production engineers always take every opportunity to design fixtures and machines for twin or multi-machine operating?

How about the engineering of material handling, not only in the production departments, but in the Goods Receiving section, the Stores, Plant Department or Tool Room? So often one sees skilled toolmakers and plant engineers' men handling heavy tools

and machines with blocks of wood, pipes and crowbars, yet our recent Material Handling Exhibition showed that first-class labour saving equipment is available. We still find even in modern factories, maintenance engineers, electricians and carpenters using hand scrapers, hack saws, hammers and chisels, jack planes, hand drills and paint brushes—yet efficient portable power tools have been available for years. Is it lack of engineering production or tradition which has to send us to America to see them used?

Recently we made a drive in this direction, and information on the portable power equipment available is discussed at the departmental Works Committee, and a list of the equipment is displayed in the Maintenance and Tool Department. We are now laying down an induction procedure for Toolmakers and Plant Engineers in order to inform them of the company's standard of expectancy, and the facilities of the equipment and services available.

We have been so appalled at the lack of equipment and antiquated methods which many of our contractors' men use when installing conveyors, lifts, etc., that we are including in our works' rules and services, information which is handed to them when they arrive on the site, giving a list of the portable power equipment available.

One of the most important direct production service jobs is that of machine setting, but how often we ignore the setter. Often he has no equipment supplied and not even a recognised work place, yet he can make or mar productive results, regardless of the machine tool or tooling available. Why should he not be provided with a portable work bench with spanners, packing pieces, collars and all the other standard accessories?

Often a layout of the setting sequence and simple setting gauge will considerably reduce the setting time and resultant scrap. On one particular job where this was done, the set-up time was reduced from five to two hours. Again, how often the inspector is left to his own resources by the fact that we neglect to define the inspection operations on our process operation layout.

So many production engineers do not accept it as their job to engineer inspection functions, yet surely if quality is the hall mark of British products, to ignore the work place and equipment of the inspector is only paying lip service to quality.

It is, of course, quite uneconomic to flow production operations only and let the flow of work be interrupted by sub-storage in a centralised Inspection Department. By putting inspection personnel behind a wire cage to be looked on as uncontrolled "checkers out" breeds the wrong team spirit. Wherever possible, inspection operators should be interposed on the production lines of departments.

Again, process layouts should not only state the width and thick-

ness of material, but also the economic length and quantities in which it is required. As a simple example, a certain blanking job on a power press proved that material ordered in six-foot lengths resulted in an output of 620 blanks per hour; in twelve-foot lengths output was 930 blanks per hour, but when coiled strip was specified, output rose to 1,730 blanks per hour.

Another example was soldering flux ordered in bulk, which arrived in five-gallon drums. Goods Inwards Inspection spent time checking to specification, but never questioned if it was in the right condition for use on the job. The result was that five-gallon drums were issued by the Stores to the Assembly Floor. Production engineers had never investigated how it was used, but when they found that only four pints per week were the actual requirements, and that five gallons instead of lasting ten weeks, was requisitioned every month, they discovered that unsuitable containers, evaporation and deterioration wasted more than was used. The process layout now calls for flux in half-gallon containers.

How about our methods of Progress Control? I am convinced we spend far too much time recording on paper the results of work in progress, and then investigating instead of doing something about it while it is actually happening. Visual control is the only real control, and that is why the layout of the office and factory floor is one of the most important factors in ensuring economic productivity. Office and factory floors must be planned and laid out to facilitate control. The Supervisor must be able to stand in his department and actually see what is happening.

The production engineer's job in relation to national economy is to accept the responsibility of engineering the production of every function involved, from the receipt of the customer's order to the delivery of the goods.

CREATING DESIRE FOR INDUSTRIAL PROSPERITY

I must admit that I was appalled the other day to receive a notice from a Management Institution informing me of a competition for an essay on "What Makes the Worker Like to Work?" Are we so crude in industrial relationships that we look on the worker, whoever he may be, as a guinea-pig? Why not have a competition on "What Makes the Manager Want to Shirk?" We might get a more enlightened answer.

When will we learn that what matters most is what takes place in the heart, and not what goes through the ears? If we think that the operator or craftsman is a different kind of human being to the technician, office manager, supervisor or director, we are only fooling ourselves. How do we account for the fact that many of these latter gentlemen pay an annual subscription to motoring associations, and perhaps never use the services, but are proud to

adorn their cars with badges and to take the salute? In this connection also is the fact that, having taken their car to Eire or travelled to France, they delight in leaving the G.B. plates on their car and the labels on their suitcases.

No, it may be the age of the common man, but it is the highest common denominator for which we must strive—and that is management's job. If there is no desire for industrial prosperity, management must accept the major responsibility to raise that desire in individuals, starting with the top line supervision.

How many managers make a daily tour of their offices and factories, and show their personal interest in creating the desire for industrial prosperity by talking on the shop floor to their supervisors, craftsmen and operators? How many of us spend a couple of hours each month with the departmental supervisor, asking to be shown the improvements his department has put into effect during the past month?

A technique in leadership development which has shown us remarkable results is that, in presenting departmental efficiency, instead of indicating this under departmental names or numbers, it is shown against the name of the supervision. We no longer show the direct productive efficiency for the Grinding Department, but Mr. James' efficiency; we no longer state the weekly scrap report on the Diecast Section, but Mr. Johnson's value of scrap; no longer do we indicate the burden costs of the Toolroom, but Mr. Brown's burden costs.

Also, at our weekly Monday morning Production Progress Meetings which our Production Superintendents, Chief Inspector, Purchasing Manager and Time Study Chief attend, each Superintendent states his achievement against his target, and explains why, if he failed. He also explains his anticipated problems and how he intends to overcome them in the ensuing week. This has proved much more effective than a long report and figures from some indirect recording department.

I believe we can do much more to create the desire for industrial prosperity than by laying stress on the "more from each, more from all" slogan, for example, by creating an interest in the industry, a desire of achievement and a pride in craftsmanship. Let us ask ourselves, "What does the community think of industry? Is industry a good neighbour? Do its buildings enhance the locality? Are its facilities available to local residents? What does the family know of the employer? How is the company talked of in the home? Does the young son or daughter look on the factory as the place where the old man has to go and sweat for a pittance?"

We can easily throw our offices and factories open, and by a personal invitation, ask our employees to bring their relatives along to see what part they play in industrial prosperity. At our

" Open House " days, we have also invited the local school teachers, technical college staffs, members of the local Government, local clergy, etc., to demonstrate the result of creating the desire for achievement.

One of our most successful attempts to create the desire for industrial prosperity was a five-week campaign, when the targets for achievement were under the following five headings :—

(*a*) Suggestions for the better utilisation of materials by submission of at least one material saving suggestion from each person in both offices and factory.

Objective to get people thinking, to put into practice employees helping in productive recommendations, and to pay tribute to people's knowledge of their jobs.

(*b*) Scrap reduction—with departmental targets to reduce our previous scrap target of 2 per cent. by at least 25 per cent.

Objective pride of craftsmanship, and to educate people to be quality-conscious.

(*c*) Achieving a 50 per cent. reduction in rejections and re-operations of faulty material and workmanship.

Objective to create greater care and better workmanship.

(*d*) To reduce and control the consumption of office and shop supplies such as paper work, small tools, rag, oil, etc., by 25 per cent.

Objective to make people conscious of the cost of such materials and of the waste which results from wrong application.

(*e*) To dispose of obsolete stocks by reviewing our stocks of slow moving, excessive and old stocks of materials, tools, etc.

Objective to clean up the place, review storage conditions, dispose of the material to persons who could put it to use, and reduce stocks.

The first difficulty was, of course, the problem of setting departmental standards of expectancy. In a direct production campaign the setting of targets is comparatively easy, but here we were dealing with what had previously been intangible factors. Considerable attention was therefore given to the setting of precise targets for individuals and departments, so that the element of incentive was built up. In this direction, it was an excellent opportunity for the supervisors to exercise their ability to present the objectives to their people by their own enthusiasm and leadership. It was also an excellent test of the value of our joint consultation in action on the office and factory floor.

CONCLUSIONS I believe we have suffered both nationally and industrially by complicating the issue. It is so easy to make a thing complicated—whether it is a jig or a report, and it is so difficult to get men who will reduce a problem to the simple facts.

The recent Machine Tool Exhibition demonstrated to us that there is no real insurmountable problem in production techniques or equipment. In fact, it is safe to forecast that increased industrial efficiency over the next five years will not result from some unknown revolutionary production process. It would be possible, however, to revolutionise the results towards national recovery if we engineered productive efforts by :—

(1) Accepting individual responsibility for positive action to overcome problems instead of blaming other people for wrong action or no action.

(2) Appointing managers at all levels with the technical knowledge and personal ability to get things done.

(3) Raising our standard of expectancy and surveying industrial efficiency in order to set targets for achievement.

(4) Insisting on industrial efficiency from everyone, and readjusting the ratio of indirect to direct production personnel.

(5) Using tradition as a background, and not allowing restrictive practices to define future activities.

(6) Correcting industrial waste by designing for ease of production and using materials in ratio to the weight of the finished article.

(7) Engineering all the processes and procedures necessary from the receipt of the customer's order to the delivery of the goods.

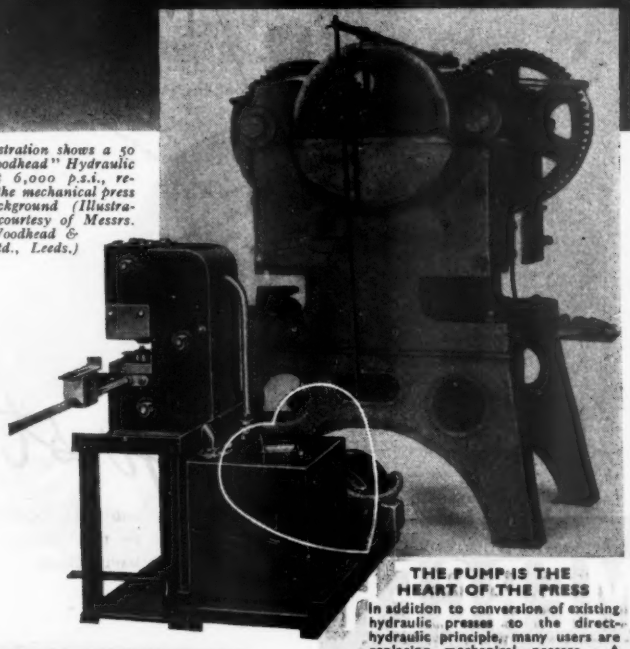
(8) Ensuring that the conditions and layout of the office and factory work place are equal to the job expected and aid visual control.

(9) Making management accept the responsibility of creating the desire for achievement and raising the social status of those whose job it is to produce.

(10) Opening the " closed shop " of trade secrets in industry and interchanging technical and administrative experiences and results.

REPLACEMENT OF MECHANICAL PRESSES BY

DIRECT-HYDRAULIC SYSTEM



The illustration shows a 50 ton "Woodhead" Hydraulic Press at 6,000 p.s.i., replacing the mechanical press in the background (Illustration by courtesy of Messrs. Jonas Woodhead & Sons Ltd., Leeds.)

THE PUMP IS THE HEART OF THE PRESS

In addition to conversion of existing hydraulic presses to the direct-hydraulic principle, many users are replacing mechanical presses. A direct-hydraulic press with "Electraulic" High-Speed Pump takes up much less space because the high pressure (up to 7,000 p.s.i.) enables it to be compact. Controlled pressure by a turn of a knob, unaffected by thickness of work or length of stroke. Unbreakable—cannot be overloaded.

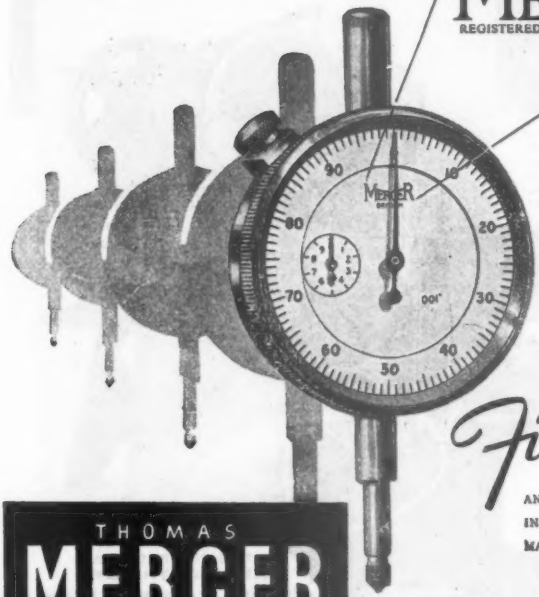
ELECTRAULIC
HIGH SPEED
HYDRAULIC PUMPS

TOWLER BROTHERS (Patents) LTD., RODLEY, Nr. LEEDS

TR.22

See the name

MERCER
REGISTERED TRADE MARK



First

AND STILL LEADING
IN DIAL GAUGE
MANUFACTURE

THOMAS
MERCER
LTD

Est. 1858

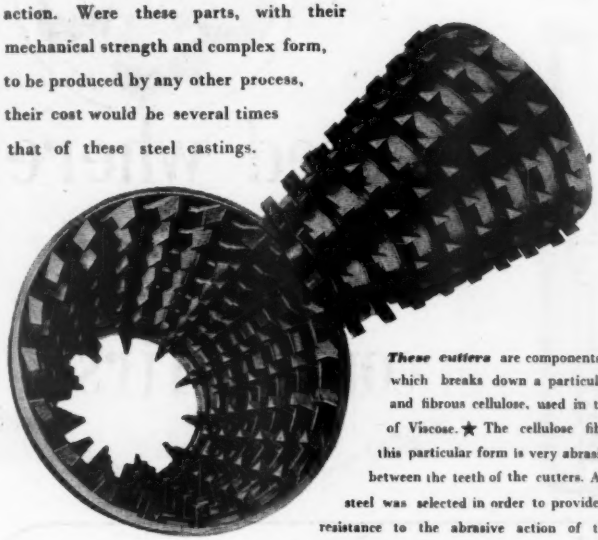
Makers of the famous 'MERCER' gauges

SALES and SERVICE

EYWOOD ROAD • ST. ALBANS • ENGLAND
TELEPHONE ST. ALBANS 5313/5

Why a STEEL CASTING ?...

because the teeth of these intricate cutter castings (there are 140 teeth in each casting) are required to have high mechanical strength and to be capable of resisting considerable abrasive action. Were these parts, with their mechanical strength and complex form, to be produced by any other process, their cost would be several times that of these steel castings.



These cutters are components of a machine which breaks down a particularly glutinous and fibrous cellulose, used in the production of Viscose.★ The cellulose fibre, which in this particular form is very abrasive, is ground between the teeth of the cutters. A high carbon steel was selected in order to provide the necessary resistance to the abrasive action of the fibre, and by suitable heat treatment, a mechanical strength of 55 tons per square inch was imparted to each casting.

★ *Viscose is the solution used in connection with Viscose rayon spinning.*

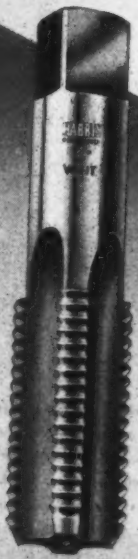
How were the teeth located so accurately? Well—that is an example of "know how" in a steel foundry. If the properties of steel are required, and the design is complex, consult your steel founder.

You can make wider use of steel castings...

The Secretaries, British Steel Founders' Association, 301 Glossop Road, Sheffield.

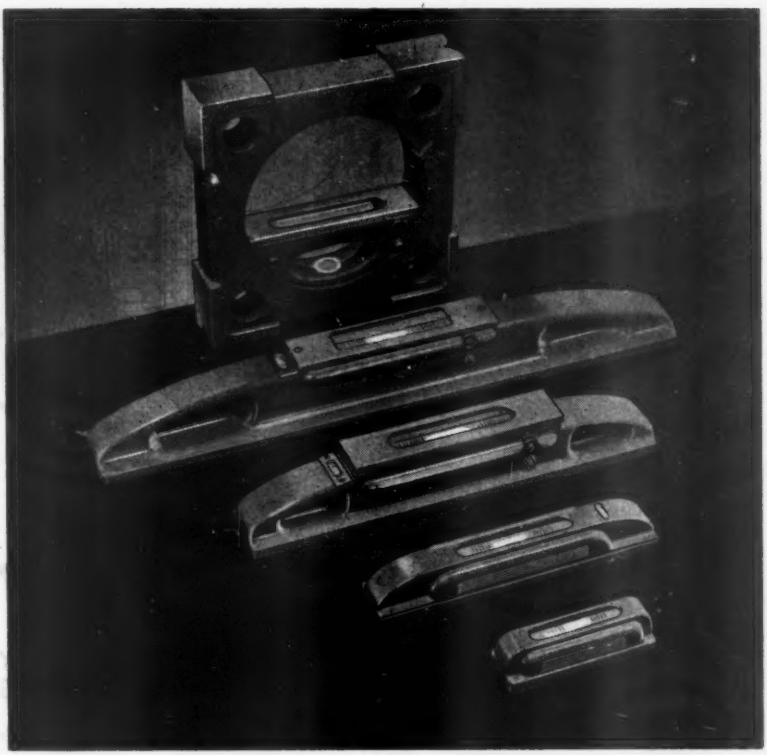
BSFA
STEEL CASTINGS

HARRIS
TAPS and DIES



-used where
precision
comes first

JOHN
HARRIS
TOOLS LTD
WARWICK phone 741 (4 lines)



WATTS

ENGINEERS'

Precision BLOCK LEVELS

(SENSITIVITIES 0.001 in. AND 0.0005 in. PER 10 ins.)

Full particulars will be supplied upon request. Write for List J.I.P.E. 24.

HILGER & WATTS LIMITED

WATTS DIVISION · 48 ADDINGTON SQUARE · LONDON S.E.5 · Phone RODney 5441

STEPS..

TO SAFETY

FOR USERS OF ZINC ALLOY PRESSURE DIE-CASTINGS

Due to the change over from wartime conditions there is a considerable amount of secondary and re-melted Zinc Alloy in circulation...

Inter-crystalline corrosion caused through an impurity content of even a few thousandths of 1%, endangers the life of your castings. Protect **YOUR** interests by taking **TWO STEPS....**

STEP No 1 Specify Zinc Alloy Die-castings which conform to B.S.S. 1004.

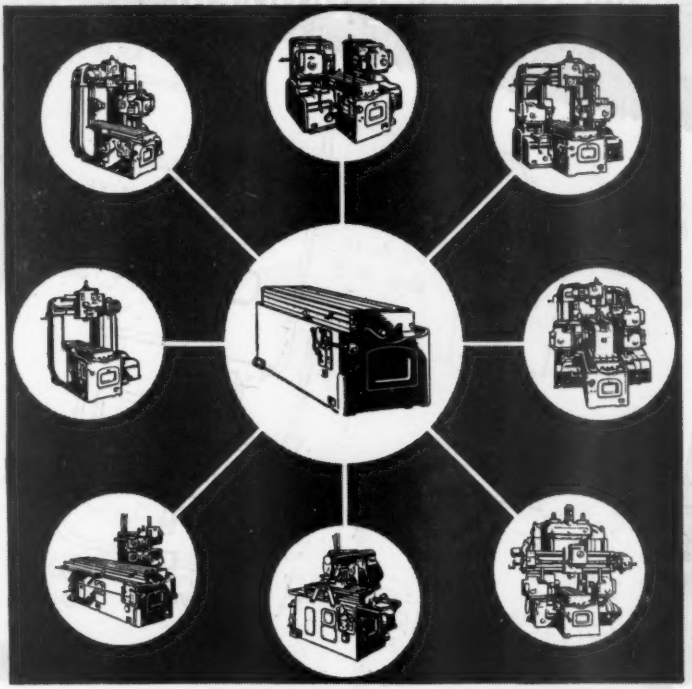
STEP No 2 Contract to have a reliable metallurgical test carried out, as a routine monthly check on the specification of Zinc-Alloy Die-castings taken at random from incoming supplies.

WOLVERHAMPTON DIE-CASTING CO. LTD.

GRAISELEY HILL . WOLVERHAMPTON

Telegrams : DIECASTINGS, WOLVERHAMPTON. **Telephone : 23831/4 WOLVERHAMPTON.**

THE CINCINNATI HYDROMATIC MILLING MACHINE



Combine Operations—Reduce Costs

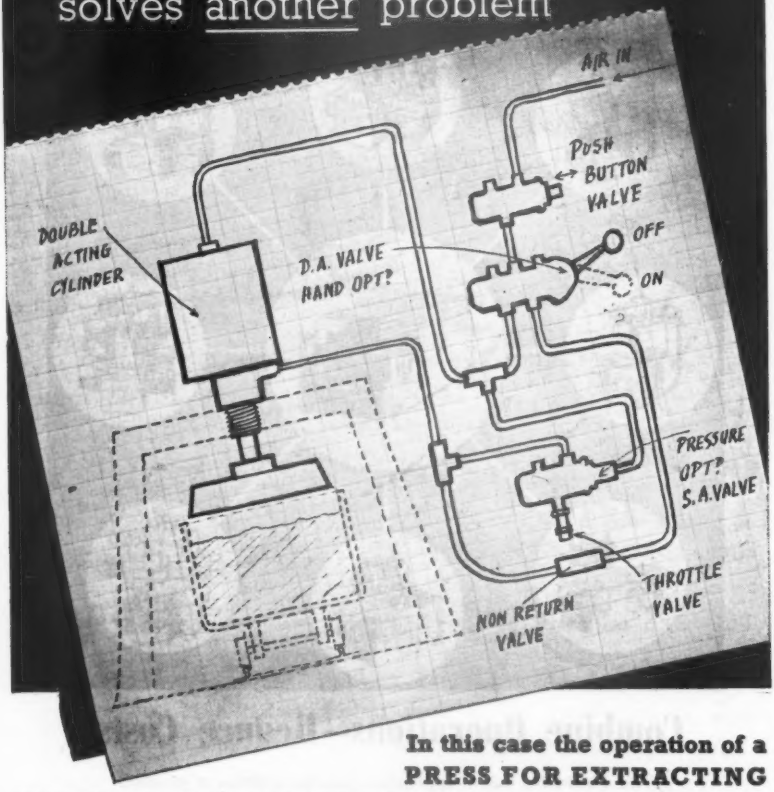
From a bed-table unit of appropriate size, the addition of standard and complementary units produces the Hydromatic Milling Machine suited to the requirements of the chosen component, enabling the maximum number of operations to be performed simultaneously. Investigate this system of construction in relation to your own needs and obtain increased production at less cost.

CINCINNATI

CINCINNATI MILLING MACHINES LIMITED, TYBURN, BIRMINGHAM, 24.

Sales Representatives for Great Britain and Northern Ireland:
Charles Churchill & Company Ltd., Coventry Road, South Yardley, Birmingham, 25
Sales Representatives for Eire: Booth Bros. Ltd., Dublin.

Air aids production — Maxam solves another problem



In this case the operation of a PRESS FOR EXTRACTING MOISTURE FROM SEAWEED PRIOR TO PROCESSING.

The industrial applications of MAXAM special purpose, air-operated equipment are practically unlimited. If you have a problem—send it to:—

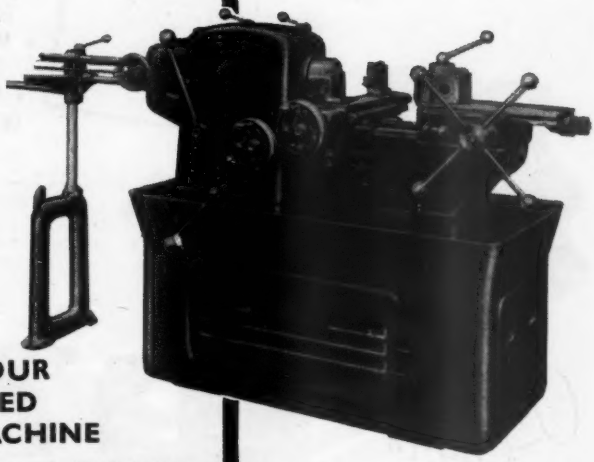
MAXAM
PNEUMATIC EQUIPMENT

CLIMAX ROCK DRILL AND ENGINEERING WORKS LIMITED
4, Broad Street Place, London, E.C.2. Works: Carn Brea, Cornwall

TAS/CX441

T&W

No. 2 Capstan lathe. Bar Capacity up to 1" diameter.



THE HOUR
THE NEED
THE MACHINE

This new capstan lathe definitely gives faster production. Relatively few moving parts, some of light alloy, permit extremely fast starting, stopping and reversing movements which are foot controlled to free operators' hands. Capacities up to 2" bar dia. Built-in motor and electrical controls.

★ Trouble free automatic bar-feed. Pneumatic or hand locking for collets and chucks. Rapid interchange between bar and chuck work. Choice of 3 speed ranges, each with 12 speeds (6 if no gearbox). 6 power-feed rates to turret with same feed-shaft speed.

REASONABLE DELIVERIES

TIMBRELL & WRIGHT LTD.

SLANEY STREET . BIRMINGHAM 4.

Telephones: Colmore 4523-4. Central 1201.
Telegrams: "Revolving" Birmingham.

Hopwood

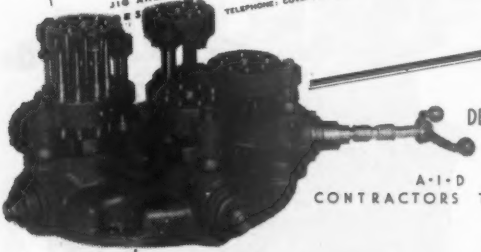
SAMUEL GILL & SONS
(ENGINEERS) LIMITED
LYTHALLS LANE, FOLESHILL
COVENTRY

ENGINEERS
TOOL MAKERS
JIG AND TOOL

G & SONS

TELEPHONE: COVENTRY 88603/4

JIGS, GAUGES
MACHINE TOOLS
MEASURING
INSTRUMENTS



• JIGS • TOOLS
GAUGES •
• MACHINE
TOOLS •
• MEASURING
INSTRUMENTS

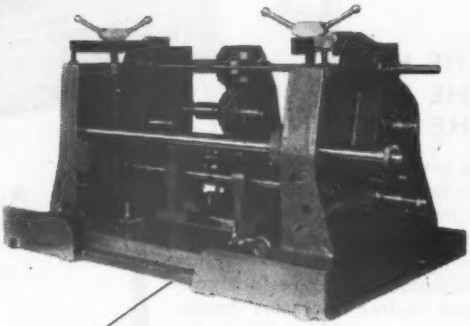
DESIGNERS *and* MANUFACTURERS

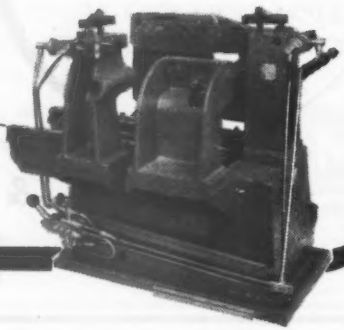
A·I·D APPROVED
CONTRACTORS TO H.M. GOVERNMENT

Quality Tools

FOR THE

AIRCRAFT
COMMERCIAL VEHICLE
AND
MOTOR INDUSTRIES





G & SONS AND SONS

SERRATED BLADE CUTTERS

In the production of their range of textile machinery, Platt Brothers & Co. Ltd., Barton Works, Manchester, make extensive use of GALTONA O-K serrated blade cutters. We illustrate the milling of feed plates for carding engines. There are GALTONA O-K cutters for every milling job. Note that you can have blades of high speed steel, solid Stellite or cemented carbide tipped.

Richard Lloyd Limited

STEELHOUSE WORKS · OLIVER STREET · BIRMINGHAM 7

Telephone: Aston Cross 3001 (10 lines) Telegrams: "Cogs, Birmingham"

North of England Representative: A. V. GREEN, 50/51, Britannia House, Wellington Street, Leeds.
AGENTS — LONDON: J. O. MADDOCK, 13, Bayham Road, W.4.
SCOTLAND Messrs. STUART & HOUSTON, 5, York Street, Glasgow, C.2. W. of ENGLAND: S. H. BRIDSON 480 Portway, Bristol.
Members of the Gauge and Toolmakers Association.

HARPER ROAD • WYTHENSHAWE • MANCHESTER
PHONE: WYTHENSHAWE 2215. **GRAMS: PNEUTOOLS, PHONE**

We can now accept your enquiries for

JIGS·FIXTURES & GAUGES

PRESS TOOLS • MOULDS AND SPECIAL PURPOSE MACHINES

of all kinds

Up-to-date shops specially laid out and equipped for making, on a production basis, every type of precision ground gauges; limit snap, form, calliper, taper and special purpose gauge, as well as jigs and fixtures of all kinds, press tools, moulds and special purpose machines. Highest class workmanship and accuracy guaranteed.

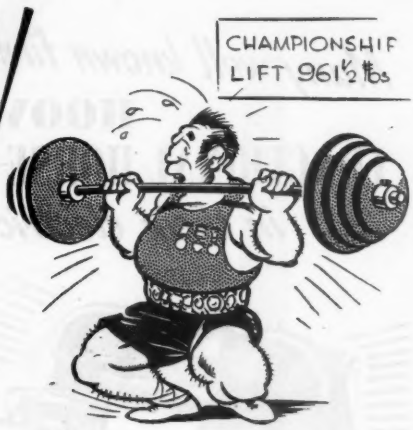
G.P.A. TOOLS & GAUGES LIMITED

Guaranteed Precision Accuracy

Members of the Gauge & Tool Makers' Association

HEY!

LIFT IT BY KING



King Electric Chain Pulley Blocks save time and effort and speed up output. This means more production and bigger profits. There is scarcely any process involving lifting and shifting which cannot be greatly helped by a King Electric Pulley Block. Capacities from 5 cwts. to 10 tons all fitted with patent safety limit switches. **MANY TYPES UP TO 1 TON CAPACITY EX STOCK.**

WRITE FOR ILLUSTRATED BOOKLETS.

GEO. W. KING LTD.

MAKERS OF ELECTRIC PULLEY BLOCKS, CRANES AND CONVEYORS.
WRITE FOR ILLUSTRATED BOOKLETS.

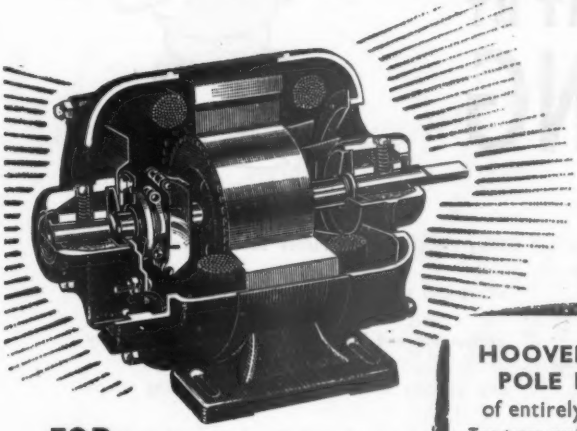
P.B.B. WORKS, HITCHIN, HERTS

Many well known firms are now fitting

HOOVER

FRACTIONAL HORSE-POWER MOTORS

in their electrical appliances



FOR many years Hoover engineers have been studying, designing, developing and perfecting small Fractional Horse-Power Motors. The result is the Hoover range of F.H.P. motors, considerable quantities of which are now being used by the leading manufacturers of electrical appliances.

Strongly constructed, compact in size and designed to give constantly uniform power under exacting running conditions, they are ideal for use on Refrigerators, Washing Machines, Pumps, Compressors, Catering Equipment, Machine Tools, etc.

Three basic types of squirrel cage induction motors are available: Split Phase, Capacitor Start or Three Phase. H.P. range 1/6, 1/4, 1/3, 1/2. Speeds 940, 1425 and 2850 rpm. Supplied with Solid or Resilient mounting Ball or Sleeve Bearings. Thermal Overload protection (if desired). For all standard voltages. Full particulars and technical data will gladly be sent on request, or better still, may we send our representative to discuss your motor problems with you.

HOOVER SHADED POLE MOTORS

of entirely new design

Two types available:—

S.P. 300 Series

400 grm/cms. 1200 rpm. approx.

S.P. 200 Series

130 grm/cms. 950 rpm. approx.

Suitable for 200/250 volts.

50 cycles A.C.

with or without mounting lugs.

HOOVER LIMITED

PERIVALE · GREENFORD · MIDDLESEX

PRODUCTION tooling
at its best.....

EXPORT ENQUIRIES INVITED

DORMER BRAND.

THE SHEFFIELD TWIST DRILL AND STEEL CO. LTD.
Summerfield Street, Sheffield 11, England
Phone: Sheffield 24137 (5 lines) Grams: PROELLS
London Office: Thames House, Queen Street Place, E.C.4
DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS MERCHANT

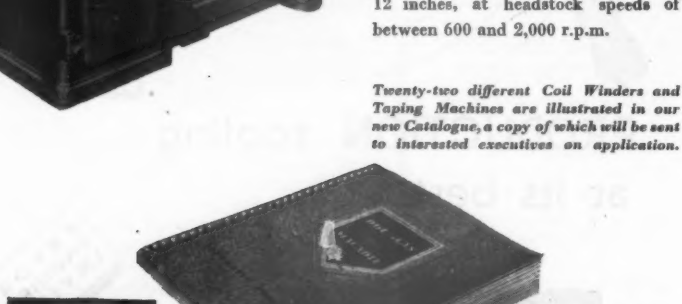
DOUGLAS AND MACADIE

Automatic

COIL WINDERS

The large illustration depicts the new improved "Douglas" Fully Automatic Multi-Winder, specially developed for the high-speed production of large quantities of coils with or without paper interleaving. It will produce round, square or rectangular coils up to 6" each in length and up to 4½" diameter. As many as 12 smaller coils can be wound simultaneously within the total available winding length of 12 inches, at headstock speeds of between 600 and 2,000 r.p.m.

Twenty-two different Coil Winders and Taping Machines are illustrated in our new Catalogue, a copy of which will be sent to interested executives on application.



Sole Proprietors and Manufacturers :

The AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON • S.W.1 *Telephone: VICTORIA 3404/9*

NAMCO "ROLL-MATIC"

THREAD & FORM ROLLING MACHINE

A powerful machine, simple in operation ; designed primarily for rolling standard threads or special forms on solid or hollow parts ranging from the smallest to 1¼in. diameter and on parts or rods of unlimited length up to ¾in. diameter.

Because of the simplicity and strength of its basic design and the quick and easy interchangeability of working heads, ROLL-MATIC is also adaptable to high precision requirements on a wide variety of 1st and 2nd operation work such as burnishing, knurling, serrating.

For normal threading requirements, production up to 900 pieces per hour is consistently maintained with hand-loading. Higher production is possible when the work is adaptable to magazine-feed.

May we send you further particulars ?

BURTON, GRIFFITHS & CO. LTD.

FACTORS OF HIGH CLASS MACHINE & SMALL TOOLS

MARSTON GREEN, BIRMINGHAM

LONDON · MANCHESTER · LEEDS · BRISTOL · CARDIFF · NOTTINGHAM · GLASGOW · BELFAST

finishing

Finishing a die casting made with MAZAK Alloy (B.S. 1004) is a much simpler business than turning the demon of St. Ethelwulfa's into the debutante of Eaton Square. One of the outstanding qualities of MAZAK castings is the clean smoothness of surface so important to economical and successful finishing—whether by electro-plating, enamelling. Cronak treatment or any other process.

Because the basis of MAZAK is 'Crown Special' zinc of 99.99+% purity, the objections to early die casting alloys have been overcome. Inter-crystalline corrosion—which causes distortion and disintegration—has been banished. Every batch of MAZAK is spectrographically examined for purity and composition.

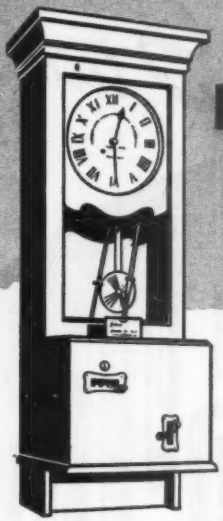
Other advantages of MAZAK include high tensile strength; high impact strength; dimensional stability; durability; ductility; suitability for complex shapes and thin sections; and high corrosion-resistance. Above all, MAZAK provides *the optimum combination of these qualities.*

When such qualities are essential to die castings, use or specify MAZAK Alloy (B.S. 1004).

MAZAK

IMPERIAL SMELTING CORPORATION LTD. 37 DOVER STREET LONDON W.1

MILLS
GROOVED PINS AND
Studs
GP.8
GP.11
GP.5
GP.12
GP.10
GP.7
GP.9
GP.3
GP.6
GP.2
GP.1
GP.4
Used in over a hundred industries, replacing taper pins, screwed pins and many other types of fastening, with safety, efficiency and economy.
No reamering, no tapping, no threading required—simply drill a plain parallel hole and drive in the grooved pin or stud.
Made in steel, brass, copper, or with plated finish.
GS.2
GS.1
EXORS OF JAMES MILLS LTD
BREDBURY STEEL WORKS
WOODLEY · Nr STOCKPORT



TIME is MONEY

The Gledhill-Brook Company was intimate with the early problems associated with the design and production of time recording machines, and was first in producing efficient electric impulse recorders with accurate time-keeping free from dependence on electric frequency or external influence. Wages and cost methods have a time basis — that is where we are concerned to help.

A large number of time recording models is now available covering most of the known needs for wages and labour cost control. One of industry's immediate needs is the reduction of waste—the waste of time that costs money.

GLEDHILL-BROOK

TIME RECORDERS

GLEDHILL-BROOK TIME RECORDERS LIMITED

20 EMPIRE WORKS HUDDERSFIELD

WARDITE TUNGSTEN CARBIDE TOOL TIPS

★"Wardite" Tools and Tool Tips are in regular use cutting Steel, Cast-iron, Non-ferrous Metals and Plastics; and for Coal and Stone Drill Bits "Wardite" Grade "F R" has been found very successful

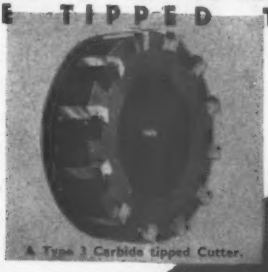
"Wardite" Tips and Tipped Tools are scientifically produced in a number of grades which adequately cover a wide range of applications. The selection of the correct grade is dependent on a number of factors with which WARDS' technical staff are thoroughly familiar. Their experience is available at call to help you with your machining problems . Write for preliminary data today.

THOS. W. WARD LTD

Phone ALBION WORKS · SHEFFIELD Grams

The Symbol of TWW Dependability

"MITIA"
CARBIDE TIPPED TOOLS

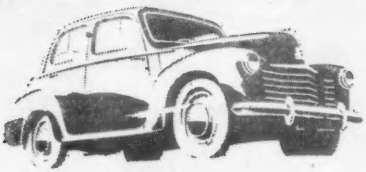

A Type 3 Carbide tipped Cutter.

A Carbide tipped Circular Saw.

Carbide tipped Reamer.

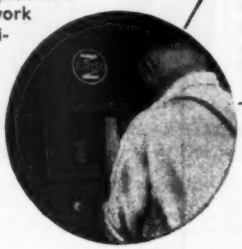
F. & B.
FIRTH BROWN
TOOLS LTD. SHEFFIELD

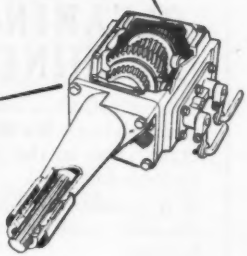
BIRLEC and the new Vauxhalls



The synchro-mesh gear box of the new Vauxhall cars employs a sliding sleeve with internal splines which take the brunt of the synchronising torque. For the local hardening of these splines, after final machining and without distortion of the sleeve, Vauxhall have installed this Birlec induction heating unit. This is just one of the tricky production heat treatment jobs handled regularly by specialised Birlec induction equipment.

For scale-free, distortionless, localised hardening as an automatic repetition process, Birlec induction heating is often the answer. Versatile units, installed direct in the production line, can be adapted for a range of generally similar work and can pay handsome dividends in quicker production, reduced grinding, cleaner finish and fewer rejects.





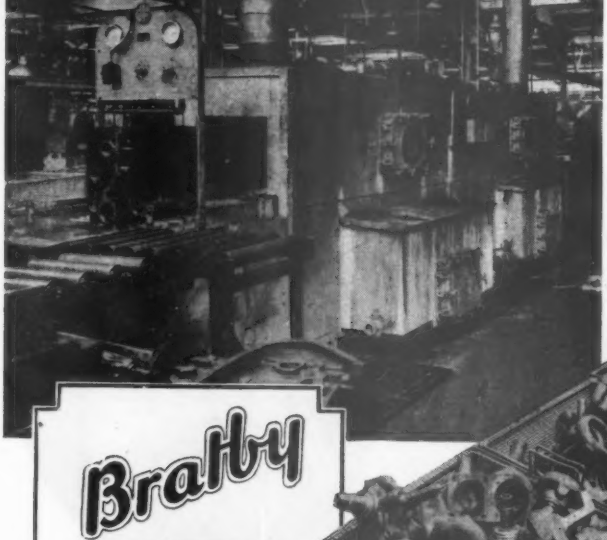
BIRLEC LTD · ERDINGTON · BIRMINGHAM 24

In Australia : Birlec Ltd., Sydney, N.S.W. *In Sweden :* Birlec Elektrougnar AB, Stockholm

HEAT TREATMENT BIRLEC & MELTING FURNACES

SM/BI9C

Each cleaning problem studied individually



Bratby

INDUSTRIAL CLEANING MACHINES

This illustration shows a machine cleaning crank cases in the production line.

It is equally capable of cleaning small parts in baskets.

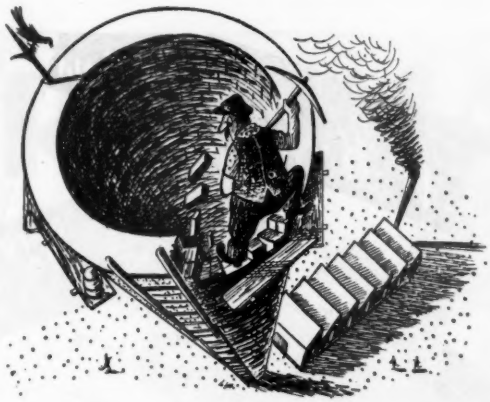
Photographs by courtesy of "Machinery"

Sole Agents for Great Britain :

GEO. H. HALES MACHINE TOOL CO. LTD., Victor House, 1, Baker St., LONDON, W.1

Designed and manufactured by :

BRATBY & HINCHLIFFE LTD., SANDFORD STREET, ANCOATS, MANCHESTER 4



A few bricks dropped . . . but what a stack of trouble!

A Ministry Fuel Engineer was called in to advise upon the operation of a boiler plant whose chimney was not drawing satisfactorily. On learning that the height of the stack had previously been reduced by 60 feet, the engineer had the base opened up. There, sure enough, was the cause of the trouble —a pile of old bricks that had been thoughtlessly dropped down inside the chimney by the steeplejack, thus reducing the draught practically to nil! Once the rubble was cleared away the plant functioned perfectly, and has ever since.

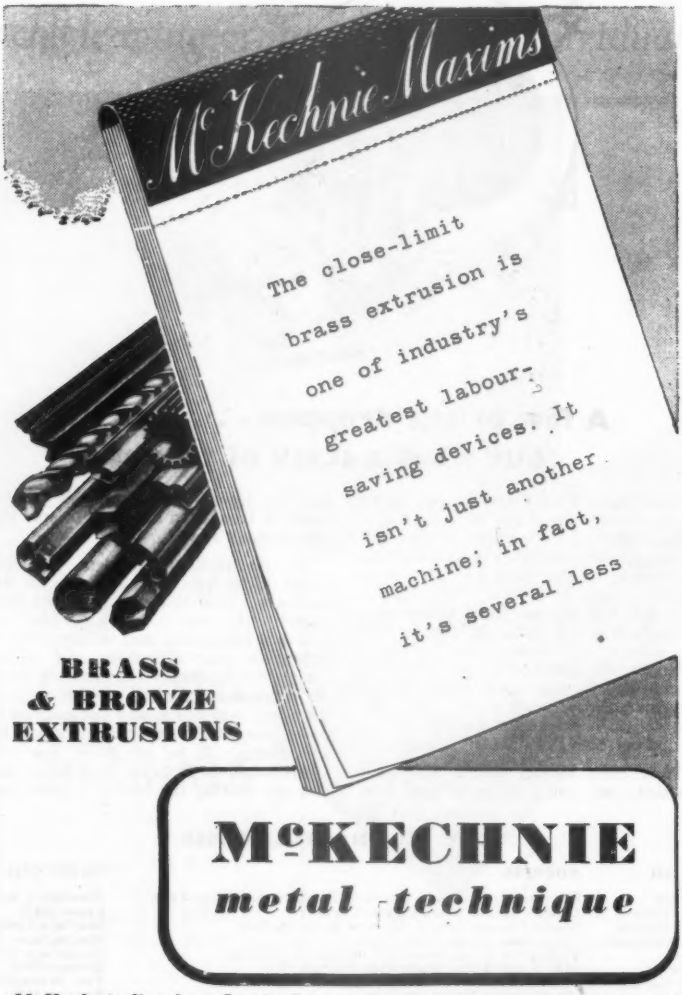
Here even Homer might well have nodded, but you'd be surprised how often it happens that quite an *obvious* cause of trouble in a factory escapes the management's eye.

No matter how confident you feel about things, you will be wise to ask the Ministry's Fuel Engineer to have a look round. He has had a great deal of practical experience and will be able to appreciate your difficulties; but at the same time he brings a completely fresh and unprejudiced mind to bear on your problems. If he has any suggestions to make, you can be sure that they will be sound ones. If he has none, you will gain confidence from the knowledge that you are making the best of a good job.

YOUR REGIONAL FUEL OFFICE

REGION	ADDRESS	TELEPHONE
Northern	Government Buildings, Ponteland Road, Newcastle-on-Tyne, 5	Newcastle 28131
North-Eastern	Century House, South Parade, Leeds, 1	Leeds 30611
North-Eastern	Mount Pleasant School, Sharrow Lane, Sheffield	Sheffield 52461
North-Midland	Castle Gate House, Castle Gate, Nottingham	Nottingham 46216
Eastern	Shaftesbury Road, Brooklands Avenue, Cambridge	Cambridge 56268
London	Mill House, 87/89, Shaftesbury Avenue, W.1	Gerrard 9700
South-Eastern	Forest Road, Hawkenbury, Tunbridge Wells, Kent	Tun. Wells 2780
Southern	Whiteknights, Earley, Reading	Reading 61491
Wales	27, Newport Road, Cardiff	Cardiff 9234
South-Western	12/14, Apsley Road, Clifton, Bristol, 8	Bristol 38223
Midland	Temporary Office Buildings, Hagley Road West, Birmingham, 17	Bearwood 3071
North-Western	Burton Road, West Didsbury, Manchester, 20	Didsbury 5180-4
Scotland	145, St. Vincent Street, Glasgow, C.2	Glasgow City 7636
Scotland	51, Cockburn Street, Edinburgh, 1	Edinburgh 34881
Scotland	1, Overgate, Dundee	Dundee 2179

ISSUED BY THE MINISTRY OF FUEL AND POWER



McKechnie Brothers Limited, Metal Works: Rotton Park St., Birmingham, 16
:: Copper Smelting Works, Widnes, Lancashire ::
Branch Offices: London, Leeds Manchester, Newcastle-on-Tyne

PRECIMAX

GRINDING LEYLAND GEAR BOX SHAFTS TO HALF A 'THOU'...

Gear box selector cross shafts 18in. long by $\frac{3}{4}$in. dia. are PRECIMAX ground to an exceptionally good finish at Leyland Motors Ltd. About 0.010 in. of metal is removed on diameter, and limits within 0.005 in. are easily held on long runs of work.

JOHN LUND, LTD., CROSSHILLS, KEIGHLEY, YORKS, ENG.

In addition to a complete line o plain and universal grinders, for hydraulic or mechanical operation, the PRECIMAX range includes fine borers with from one to 12 spindles, and fine milling machines for high speed finishing.

ASQUITH

"O.D"

THE SYMBOL OF DRILLING EFFICIENCY

ECONOMY in hole-making is assured wherever the "O.D." Type Radial Drilling Machine is installed

Catalogue R.77 gives full particulars of this type which has achieved world-wide popularity in all classes of engineering workshops.

Send for copy.

WILLIAM ASQUITH LIMITED

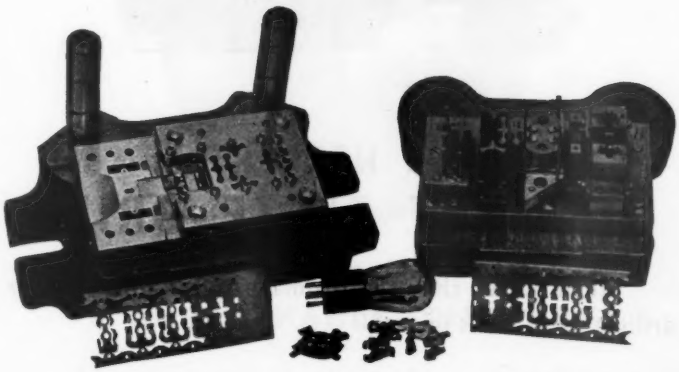
Gibbet Street, HALIFAX, England

Sales and Service for the British Isles

DRUMMOND-ASQUITH (SALES) LTD., King Edward House, New Street, BIRMINGHAM

PRESS TOOLS

LARGE OR SMALL



We are SPECIALISTS in the DESIGN and MANUFACTURE of SIMPLE, COMPOUND, SUB-PRESS, and FOLLOW-ON TOOLS

ARNOTT & HARRISON LTD.

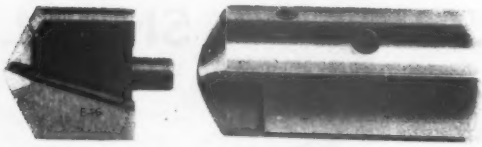
(Member of the Gauge & Tool Makers Association)

22, Hythe Road
WILLESDEN

Telephone: LADbroke **3484-5-6**

ARNOTT HARRISON WILLESDEN

AH HERBERT AH



(B)95

THE HERBERT
STRAIGHT FLUTE DRILL

Much better than the ordinary spiral flute drill for drilling deep holes in steel.

Detachable cutter is of high speed steel. The body, a few thousandths smaller than the cutter, has two straight flutes.

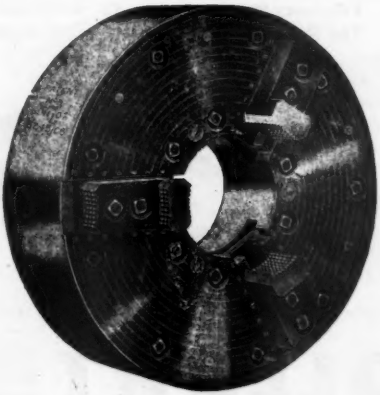
Oil is carried to the cutters through two holes drilled in the body.

SIZES MADE—$\frac{13}{16}$" to $4\frac{1}{4}$".

SIZES STOCKED—$\frac{7}{8}$", 1", $1\frac{1}{8}$", $1\frac{3}{16}$", $1\frac{1}{4}$", $1\frac{3}{8}$", $1\frac{7}{16}$", $1\frac{1}{2}$", to 3" × $\frac{1}{8}$" and $3\frac{1}{2}$".

ALFRED HERBERT LTD · COVENTRY

HERBERT



COVENTRY
UNBREAKABLE CHUCKS

The strongest chucks made. Great gripping power ; oil-tight, dirt-proof.

Readily adapted to hold irregular shapes.

Sizes 6in., 7½in., 9in., 12in., 15in., 18in., 21in., 25in., 28in., 32in.

IN STOCK :

6in., 2 & 3-jaw, 9in., 2 & 3-jaw, other sizes in four to twelve weeks.

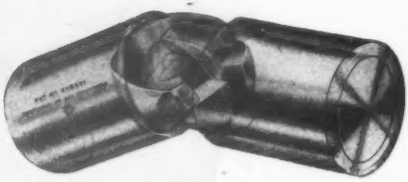
FULL PARTICULARS ON REQUEST

ALFRED HERBERT LTD · COVENTRY

Patent UNIVERSAL BALL JOINTS

For all types of remote control, accessory drives, etc.
Efficiency 98% maximum, 92% minimum N.P.L. certified.
The lightest most compact joint made.

- ONLY THREE WORKING PARTS
- FORKS SOLID WITH JOINT HALVES
- HARDENED AND GROUND WORKING FACES
- LARGE BEARING SURFACES
- SHROUDED FORKS GIVE MINIMUM DEFLECTION
- 9 SIZES. BORED FOR SHAFTS RANGING FROM ¼ in. TO 1⅛ in. DIAMETER



WE ALSO MANUFACTURE HOOKE'S TYPE UNIVERSAL JOINTS IN THE SAME RANGE OF SIZES

The **MOLLART ENGINEERING CO. LTD.**

PRECISION ENGINEERS
KINGSTON-BY-PASS
SURBITON · SURREY
ELMbridge 3352/3/4/5
Grams : Precision, Surrey

THE PIONEERS OF ELECTRICAL TIMEKEEPING

✣

Electric Clocks which operate independently of the Supply Mains

✣

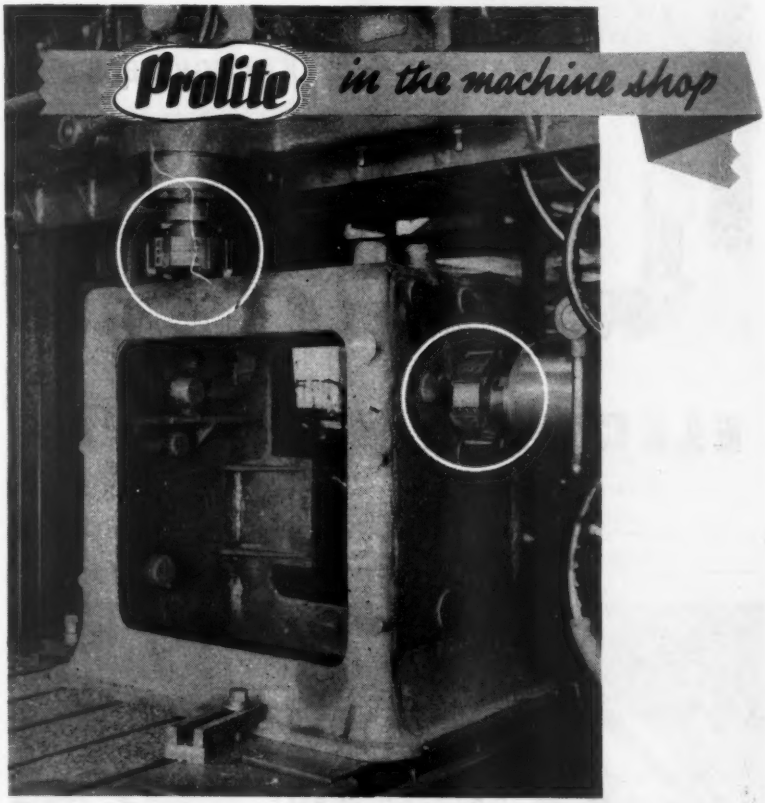
The Synchronome Electrical Impulse Clock was first produced in 1895. Since then hundreds of Factories, Educational Establishments and Municipal Establishments have been fitted with the Synchronome System of Timekeeping. It is independent of the Mains Supply and one Master Clock will control any number of subsidiary dials, Employees time recording machines, Watchmans Tell-tale Clocks, and start and cease work signals.

Write for further information and particulars of purchase outright or rental scheme

The following is a short list of businesses that are fitted with the Synchronome System of Electrical Timekeeping:

Institution of Electrical Engineers, London.
B.E.A., Kingston Power Station.
Cables & Wireless Ltd., Electra House, London.
British Broadcasting Corporation, Broadcasting House, Portland Place, London, W.1.
State Hydro-Electric Department, New Zealand.
Grid Metering & Meters Act.
Standard Master Clocks a speciality.

The **SYNCHRONOME CO., LTD.**
Abbey Electric Clock Works,
ALPERTON · MIDDLESEX · Phone : WEMbley 3643
Holders of the World's Record for Timekeeping since 1925



CAST IRON MACHINE BED being machined at 12¾ins. per minute using 7in. diameter "PROLITE-NURAKE" FACE MILLING CUTTERS

The "PROLITE" range of MUREX METALLURGICAL PRODUCTS includes:

- Tungsten Carbide Tips and Tipped Tools
- Die Pellets and Dies for All Purposes
- Wear Resisting Parts
- Tungsten and Molybdenum Rod, Wire, Sheet and Strip

PROTOLITE LIMITED

(A subsidiary company of Murex Ltd., Rainham, Essex)

CENTRAL HOUSE · UPPER WOBURN PLACE · LONDON · W.C.1

Telephone : EUSton 5666 & 6929 *Telegrams : Amusingly, Kincross, London*

ELECTRICAR

INDUSTRIAL TRUCKS

CROMPTON PARKINSON LTD.
Sales Office: CROMPTON HOUSE, ALDWYCH, London, W.C.2
Telephone: CHAncery 3333 Telegrams: Crompark, Estrand, London

PUT YOUR FACTORY INTO TOP GEAR . . .

Factory efficiency depends as much on transport as on any other single factor, because movement is more than half the job of production. Yet manual labour is still being used in many factories for moving goods from process to process. If you are not fully aware of the advantages of Electricar trucks—the speed and efficiency, the low running costs and easy maintenance, the time-saving and the money-saving—write today for the facts about modern material handling

ESSEX

BRITISH MADE

UNIVERSAL JOINTS

ON ADMIRALTY, WAR OFFICE AND AIR MINISTRY LISTS

Price List on application

HIGHWAYS *Illuminated* by

REGD. TRADE MARK **Reglo**

SLF/240

EMPLOYING 2/40 WATT 4 ft. TUBES

WATERPROOF FITTINGS FOR POST OR WALL MOUNTINGS

LIST : £25 : 0 : 0

SLF/440

TWIN UNIT FOR ANGULAR ILLUMINATION, MOST SUITABLE FOR AIR PORTS—LAGOONS, ETC.

LIST : £50 : 0 : 0

AS SPECIFIED BY LEADING CONSULTING AND CIVIL ENGINEERS AT HOME & ABROAD

NOW RELEASED FOR THE HOME MARKET

G.W.C. EQUIPMENT LTD. - The Manufacturers of Fluorescent Lighting Fittings -
66 VICTORIA ST., LONDON, S.W.1 Tel. VICtoria 4524/5

FOR RELIABLE METAL CASTINGS

SPECIFY

TECONIC

REGISTERED TRADE MARK

The Technically Controlled Castings Group

18 ADAM STREET, LONDON, W.C.2.

LAKE & ELLIOT, LTD., BRAINTREE · SHOTTON BROS., LTD., OLDBURY
S. RUSSELL & SONS, LTD., LEICESTER · HENRY WALLWORK & CO., LTD., MANCHESTER
ALEX. SHANKS & SON, LTD., ARBROATH · JOHN WILLIAMS & SONS (CARDIFF) LTD

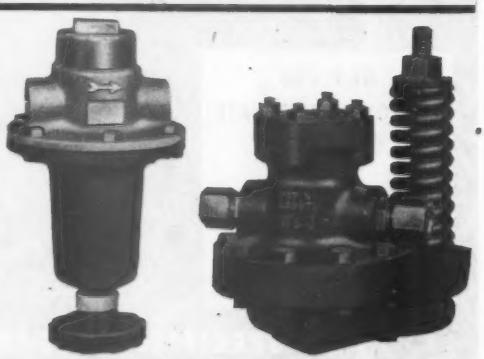
PRESSURE REDUCING VALVES

Designed and produced by experts, these valves give a maximum flow with immediate sensitive pressure control and minimum sympathetic drop with variations of upstream pressure.

No glands, no sticking or chattering, readily accessible. Well-made and perfectly balanced these valves give excellent service under all conditions.

Please state purpose of valve when ordering.

Guaranteed for 12 months.



WILLIAMS & JAMES
(ENGINEERS) LIMITED
GLOUCESTER ENGLAND

TELEPHONE: 24021 (2 LINES)

MANUFACTURERS OF
PRECISION
MEASURING EQUIPMENT

Length Bars & Accessories
Sine Bars & Sine Tables
Slip Gauges & Accessories
Toolmakers Flats
Surface Plates
Straight Edges
Bench Micrometers
Diameter Measuring Machines
Adjustable Limit Snap Gauges
Comparators
Screw Gauges
Jigs & Fixtures

PITTER GAUGE & PRECISION TOOL Co. LTD.
MARKET ST. WOOLWICH S.E.18 PHONE WOO 4252

Automatic Feeds for any Press

CONSULT

HUMPHRIS

THE PRESS EXPERTS

HUMPHRIS AND SONS LTD · 94 PARK ROAD · PARKSTONE · DORSET

14451A

STOP WATCHES

For time and motion study, process control, production timing, and for a host of other occasions, a Stop Watch can give invaluable aid, but it must be accurate to a fine degree. For over a century and a half, Camerer Cuss have been renowned for accurate timekeepers of all kinds. Their name is your guarantee of Stop Watch accuracy.

Stop Watches can be supplied in several standard patterns and also calibrated for special purposes. Let us know your requirements—and we will supply just the Stop Watch you need.

FOR TIME AND MOTION STUDY

CAMERER CUSS

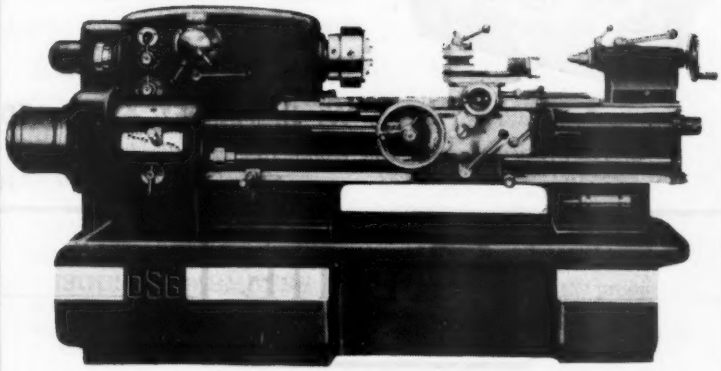
Makers of Good Clocks & Watches since 1788

NEW OXFORD STREET · LONDON · W.C.1

Also 91, Kingsway, W.C.2

For High Class Production or Toolroom Work

TYPE 13



13" SWING PRECISION LATHE.

from our New Range 13" to 30" Swing

Flanged Vee Rope Motor Drive
Self-Adjusting Clutch
Middle Bearing to Spindle
Final Drive to Spindle by Vee Ropes
Patent "Fastlock" Spindle Nose
Wide Range of 12 Spindle Speeds
Wide Range of Threads

CATALOGUE and PARTICULARS on request

Dean SMITH & Grace Ltd
THE LATHE PEOPLE
KEIGHLEY ENGLAND

"MARLCO" ALL-PURPOSE COLLET CHUCK

Is bored straight through and can be used with its loose tang or draw bolt. Range of collets 1/8″—3/4″ x 1/32″ from stock, specials on request.

Has removable work stop and is supplied with circlips which prevent movement of cutting tools.

Available with all popular Morse and Brown and Sharpe Taper shanks.

Full particulars on request.

W. H. MARLEY & CO. LTD.

S. Tools Dept., New Southgate Works, 105, High Road, London, N.11
Telephone: ENTerprise 5234.

CROLTITE

AIR-HYDRAULIC PRODUCTS

PROV. PATENT No. 20298/45.

AIR-HYDRAULICS for Clamping on Jigs and Fixtures
AIR-HYDRAULICS for Forming, Blanking and Piercing
AIR-HYDRAULICS for Plastics—"Pressure or Injection"
AIR-HYDRAULICS for Embossing, Riveting and Trimming
AIR-HYDRAULICS for Crimping, Clamping and Coining
AIR-HYDRAULICS Economically replaces other methods

SIMPLY CONNECT TO SHOP AIR LINE AND SAVE WORRY AND LABOUR
MANY OTHER ADAPTATIONS

3 Ton Air-Hydraulic Press (covers removed)

Submit your problems to:
CROLT ENGINEERING LIMITED
WATERLOO STREET · · BOLTON

THE ZINC ALLOY DIE CASTERS ASSOCIATION includes all the leading zinc alloy die casters in the U.K. The Association and its Members welcome all enquiries on the properties, design and application of the castings. Problems are submitted anonymously to the experts on its Technical Committee, whose verdict is impartial. A list of publications will be sent on request. Enquiries regarding the supply of castings should be sent to Members whose names are given below. The Association is a non-trading body and is in no way concerned with any questions of price.

FULL MEMBERS Firms mainly engaged in the production of castings for general sale.

ALLOY PRESSURE DIE PRODUCTS LTD., WILLENHALL.
AVON DIECASTING CO. LTD., BIRMINGHAM.
BIRMINGHAM ALUMINIUM CASTING (1903) CO. LTD., BIRMINGHAM.
BRAID ENGINEERING LTD., DERBY.
BRITISH DIE CASTING & ENG. CO. LTD., LONDON.
CHASE NON-FERROUS METAL CO. LTD., ENFIELD.
DIE CASTING MACHINE TOOLS LTD., LONDON.
DYSON & CO. ENFIELD (1919) LTD., ENFIELD.
FRY'S DIECASTINGS LTD., LONDON.
GILLS PRESSURE CASTINGS, BIRMINGHAM.
JACKSON, HEYWOOD & CO. LTD., WHITEFIELD, nr. MANCHESTER.
MANCHESTER DIE-CASTING CO. LTD., MANCHESTER.
METAL CASTINGS LTD., WORCESTER.
PATENT DIE-CASTINGS CO. LTD., LONDON.
SPARKLETS LTD., LONDON.
STREBOR DIECASTING CO. LTD., RADCLIFFE, LANCS.
WESTERN DIECASTING LTD., BRISTOL 5.
WOLVERHAMPTON DIECASTING CO. LTD., WOLVERHAMPTON.

ASSOCIATE MEMBERS Firms mainly engaged in the production of castings for use in their own products.

ACME WRINGERS LTD., GLASGOW.
A C-SPHINX SPARK PLUG CO. LTD., DUNSTABLE.
THOS. ASHWORTH & CO. LTD., BURNLEY.
ASSOCIATED BRASSFOUNDERS BIRMINGHAM LTD., LONDON.
W. & T. AVERY LTD., BIRMINGHAM.
BRITISH THOMSON-HOUSTON CO. LTD., BIRMINGHAM.
WM. COULTHARD & CO. LTD., CARLISLE.
EVERED & CO. LTD., SMETHWICK.
HAWKHEAD, BRAY & SON, LTD., HALIFAX.
CHARLES HILL & CO. LTD., BIRMINGHAM.
INGALL, PARSONS, CLIVE & CO. LTD., BIRMINGHAM.
ARCHIBALD KENRICK & SONS LTD., WEST BROMWICH.
LAN-BAR LTD., BIRMINGHAM.
JOSEPH LUCAS LTD., BIRMINGHAM.
LOUIS MARX & CO. LTD., DUDLEY.
MECCANO LTD., LIVERPOOL.
METTOY CO. LTD., NORTHAMPTON.
ORB ENGINEERING WORKS LTD., MANCHESTER.
PHILLIPS & CROSS LTD., BIRMINGHAM.
RAWLINGS MANUFACTURING CO. LTD., LONDON.
SHAW FOUNDRY CO., WILLENHALL.
STANMORE ENGINEERING CO. LTD., STANMORE, MIDDLESEX.
T.A.L. DEVELOPMENTS LTD., LONDON.
TREMO MOULDINGS LTD., CARDIFF.
VONO LTD., TIPTON, STAFFS.
WESTINGHOUSE BRAKE & SIGNAL CO. LTD., CHIPPENHAM.
WITHERS (WALSALL) LTD., WALSALL.
YALE & TOWNE MANUFACTURING CO., WILLENHALL.

ZADCA

ZINC ALLOY DIE CASTERS ASSOCIATION

Lincoln House, Turl Street, Oxford. Telephone Oxford 48088

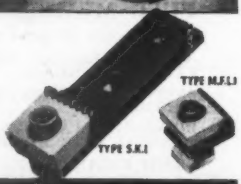
A Clamp with Unlimited Application in Your Plant

CLINO-CLAMP

Unproductive times can be considerably shortened by the use of CLINO-CLAMP standard clamps on all types of Machine Tools. They supersede the improvised packing pieces and holding down fixtures so often used in the machine shop. They are compact, rigid, give a positive grip and owing to very low over-all height they allow maximum clearance for cutting tools.

Six different types of clamp are available, and a combination of different types can be used for irregular shaped work.

A fully descriptive folder will be sent on request.



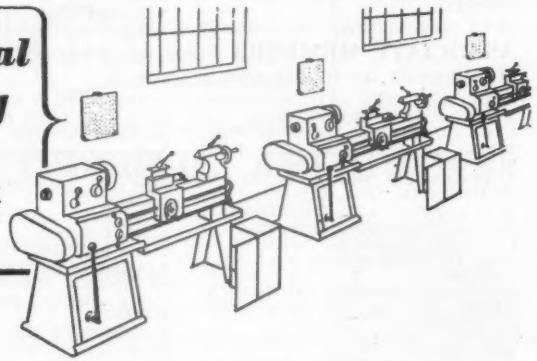
ADAM *Machine Tool Company Limited*

ACME WORKS WAVERLEY ROAD ST. ALBANS HERTS

Industrial Heating

•

400 W MYCALEX PANELS



The Cheapest Heat for

COLD CORNERS : OFFICES : NISSEN HUTS : STORES : TEMPORARY BUILDINGS LAVATORIES : GARAGES *(anti-frost)* OVENS : DRYING CABINETS, ETC.

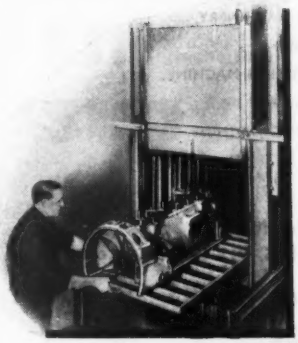
SHOCK Proof... FIRE Proof... FOOL Proof

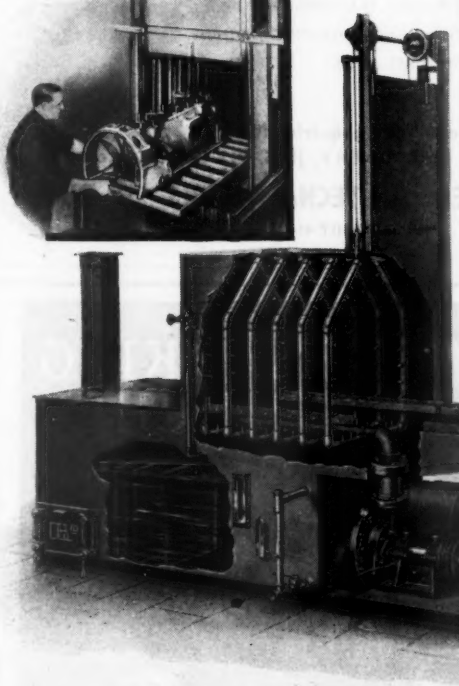
For control and economy utilise the MYCALEX THERMOSTAT in conjunction with these and any other electrical heater. Apply for details to —

THE MYCALEX CO. LTD., CIRENCESTER, GLOS.

MY 20

DAWSON·METAL PARTS CLEANING *and* DEGREASING PLANT for ENGINEERS





Made in three Standard models, DAWSON HYDROS will degrease and clean all types of metal parts. Small parts such as nuts, bolts, valves, are fed into the machine in wire mesh baskets while larger parts such as motor car engines are placed on the movable rack as shown in the top illustration.

The machine gives a pumped solution wash under pressure at 180 F. and after double filtration is re-pumped through a D B.L. high efficiency centrifugal pump to the jet pipes which are shown in the sectional illustration alongside. The jets are arranged so that clogging is reduced to a minimum.

A counter-balance door is provided for ease of operation.

Sole Distributors & Consultants: **DRUMMOND-ASQUITH (SALES) LTD**
King Edward House, New Street, Birmingham.

Head Office & Works: DAWSON BROS., LTD Gomersal, Leeds.
Tel. Cleckheaton 1080 (5 lines)

London Works, Roding Lane South, Woodford Green, Essex.
Tel. Wanstead 7777 (3 lines)

"RECENT ACHIEVEMENTS"

ETC

OPTICAL TRANSMISSION INSTRUMENT.
LENS GRINDING AND LAPPING MACHINERY
THIRD DIMENSIONAL MECHANISM.
ELECTRONIC SELECTING AND SIZING MACHINE.
PRECISION MAGSLIP TRANSMISSION.
GLASS ETCHING AND ENGRAVING MACHINE.
JIGS AND FIXTURES *AD LIB.*

send your enquiries for
LIGHT PRECISION MACHINERY, JIGS, FIXTURES, etc. to

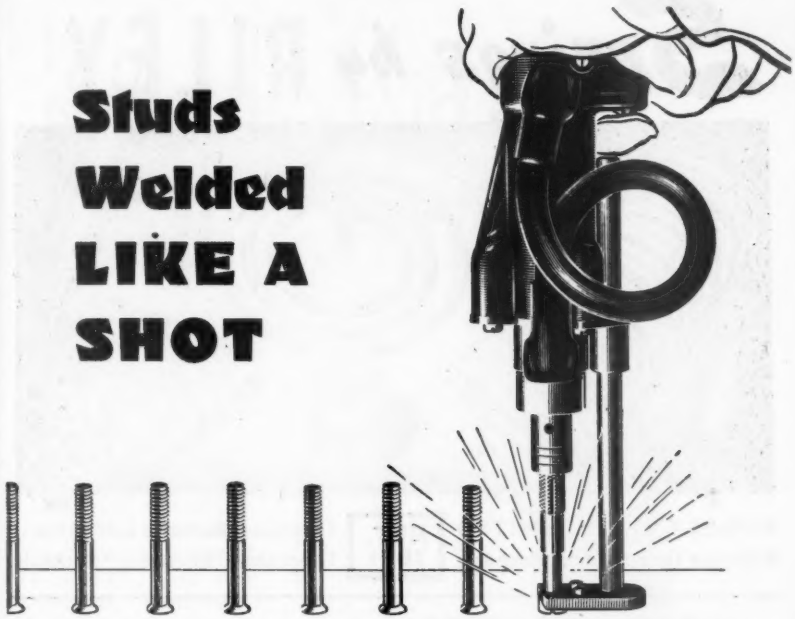
TECNAPHOT LIMITED · TECNA WORKS · RUGBY

TEL. : RUGBY 4145

Machined to precision limits from alloy steel and carefully heat-treated, PRIORITY marking punches give clear and evenly indented impressions, with each angle and stroke symmetrised. PRIORITY punches are packed in a neat hardwood box. A full range of sizes is available. Details on request.

EDWARD PRYOR & SON LTD., BROOM STREET, SHEFFIELD 10, ENGLAND
TELEPHONE: SHEFFIELD 23161 2 3: TELEGRAMS PRYOR, SHEFFIELD

Studs Welded LIKE A SHOT

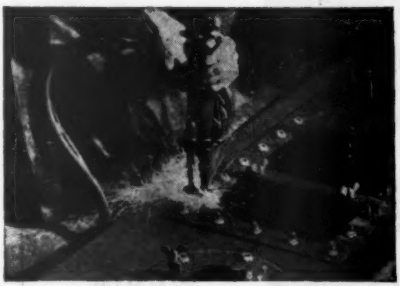


14 times faster than drilling and tapping

Why carry on with costly, time-wasting drilling and tapping when the Nelson Stud Welder can fix studs to steel 14 times faster? With this equipment, studs are so easy to fix that you can use special studs for all kinds of jobs where bolts, pins and rivets were used before.

The Nelson Welding Gun is light and easy to handle—and absolutely safe. From the touch of the trigger the welding operation is completely automatic. This not only makes for high speed, it also ensures that every weld is of the same high quality.

If fastening to steel is one of your problems, write to-day for the new Nelson brochure and find out how you can save time and cut costs.

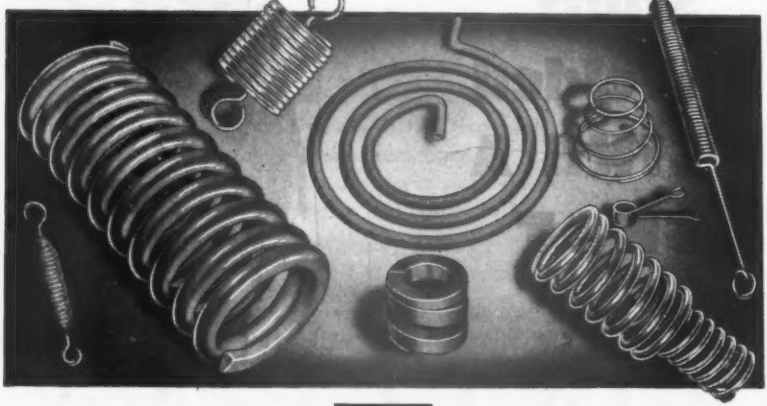


Nelson stud welding on a transformer tank—one of the many time-saving cost-cutting applications. Strength and oil tight properties of tanks are unimpaired by Nelson welded studs.

NELSON STUD WELDING SERVICE

CROMPTON PARKINSON LIMITED
PLANT DIVISION
CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2

Springs by RILEY



ROBERT RILEY LIMITED
Milkstone Spring Works, Rochdale

EST. 1821

Telephone: Rochdale 2237 (4 lines)
Telegrams: 'Rilospring' Rochdale

PRESS TOOLS

MOULDS

AND JIGS

Universal Tools LTD
TRAMWAY PATH
MITCHAM
SURREY
Phone: Mitcham 1624-5-6.

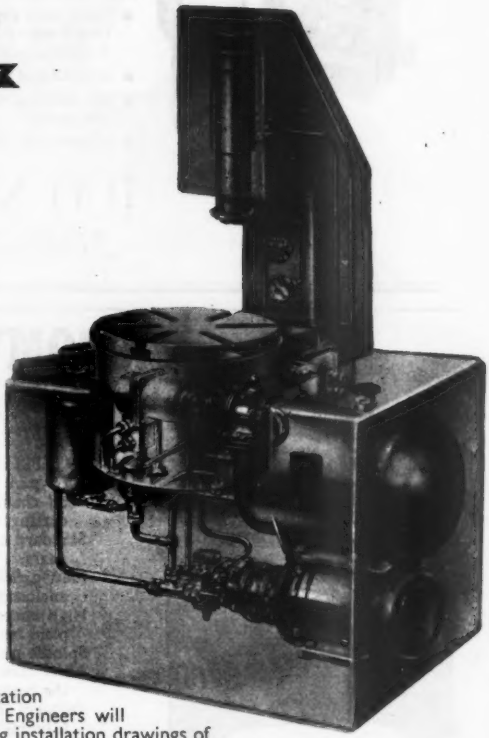
Keelavite Hydraulics

BIF 1949

MAY 2—13
CASTLE BROMWICH
BIRMINGHAM

SEE OUR EXHIBIT

V.S. DRIVES for
MACHINE TOOLS
PRESS TOOLS
FORGING, STAMPING
WELDING, MOULDING
MECHANICAL HANDLING
MACHINES and for
FOUNDRY EQUIPMENT
ROAD-MAKING
MINING, TENSION
CONTROL EQUIPMENT
TEXTILE, BAKERY
& PAPER MAKING
MACHINERY ●

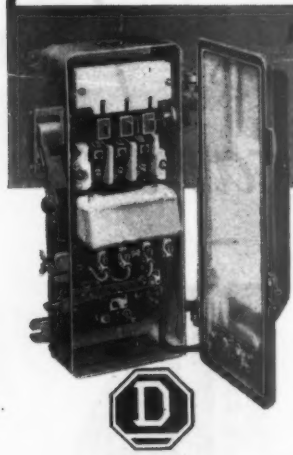


Hydraulic circuits can be designed and built up from standard Keelavite pumps motors, valves etc., to solve any problem of power distribution particularly when varying speed, varying load, frequent reversal or movements in sequence are important factors. Given detailed information relating to the proposed application of hydraulic power, Keelavite Engineers will put forward proposals, including installation drawings of the units concerned, hydraulic circuit, and any necessary electric contro unit.

● **SEE OUR EXHIBIT on STAND No. D748 at the B.I.F. CASTLE BROMWICH**

KEELAVITE ROTARY PUMPS & MOTORS LTD. ALLESLEY, COVENTRY

DONOVAN



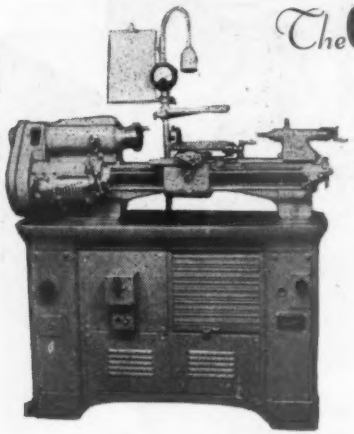
Type A.32
Size 1 Starter

Comprising a Starter and Isolator in ONE case, this Donovan A.C. Direct-Switching Contactor Starter has many features worthy of your investigation :—

- Easily-operated fully-shielded isolating switch which breaks stalled motor current in emergency.
- Interlocked switch ensures safety.
- No external wiring needed between switch and starter.
- Magnetic or Thermal Overcurrent releases.

DONOVANS

THE DONOVAN ELECTRICAL Co LTD BIRMINGHAM, 9
ELECTRICAL ENGINEERS AND STOCKHOLDERS.
PHONE - STECHFORD 2277 (P.B.X.) GRAMS - DONOVAN, BIRMINGHAM



The **CROMWELL**

3½" S.S. & S.C. LATHE

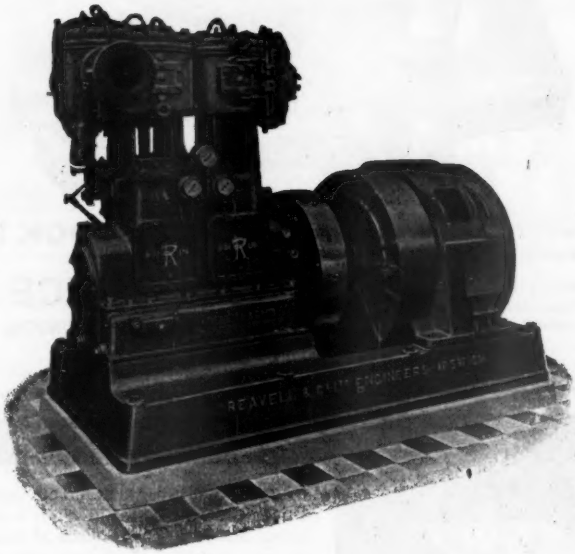
TYPES S800 & S800M (METRIC)

STEPLESS spindle speed changes with r.p.m. indicator.
Feed changes by dial. Magazine for screw-cutting.
Standard threads cut without use of change gears.
Metric, B.A. and other threads cut by using enclosed change gears.
High speed spindle in precision adjustable plain bearings.
Spindle pulley independently mounted.
All-electric spindle drive, gearless except for the back gears.
Verniers reading to .0001 in. for saddle traverse and slides.
Hardened bed, steel cabinet base.

A Machine of Incomparable Refinement and Precision

PARKSHOT, RICHMOND — BRITISH Smallpeice Ltd PRODUCT — SURREY, ENGLAND

AIR COMPRESSORS

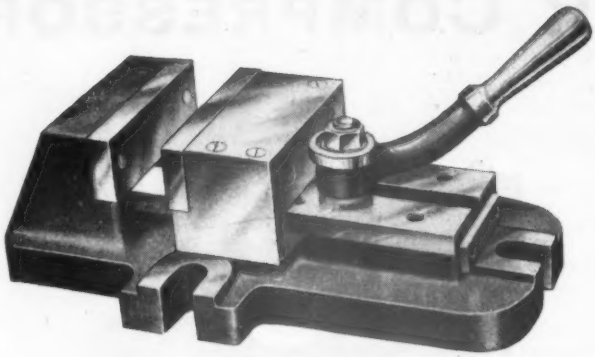


We have standard types for all capacities and pressures and can supply the most efficient and reliable machine for any duty.

REAVELL & CO. LTD. - IPSWICH

Telegrams: "Reavell, Ipswich." Telephone Nos. 2124-5-6

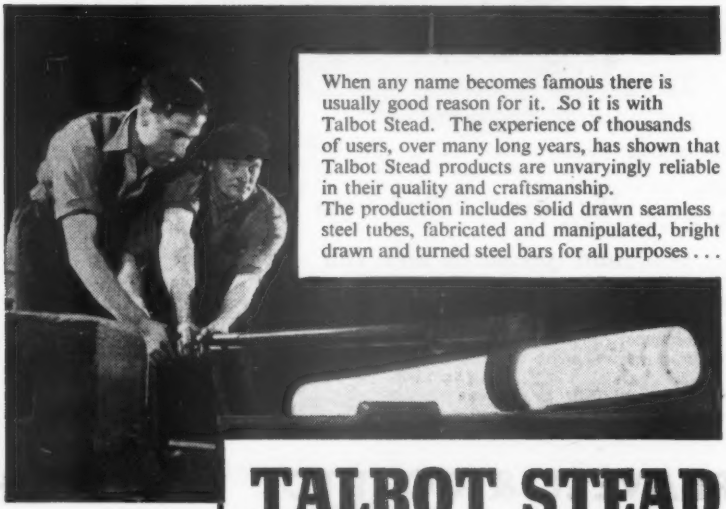
•CAM ACTION VICE FOR PRODUCTION•



JAWS — 4½" x 1⅝" OPENING — 3½"
OVERALL—12" x 8" WEIGHT—36 lbs.

JAWS are interchangeable and soft jaws for machining to component shape are available.

EX STOCK!!
FROM
C. H. JOYCE LTD.
40 MONKTON ST., LONDON, S.E.11



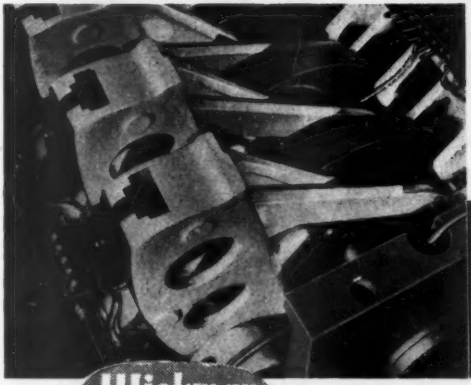
When any name becomes famous there is usually good reason for it. So it is with Talbot Stead. The experience of thousands of users, over many long years, has shown that Talbot Stead products are unvaryingly reliable in their quality and craftsmanship.
The production includes solid drawn seamless steel tubes, fabricated and manipulated, bright drawn and turned steel bars for all purposes . . .

TALBOT STEAD

A TI COMPANY

TALBOT STEAD TUBE CO. LTD · GREEN LANE · WALSALL

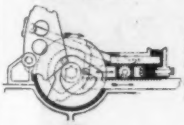
WICKMAN Multi-Spindle Auto-setting means Production up— *at less cost, in less time...*



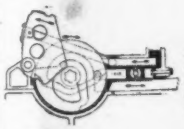
NO CAMS TO CHANGE!

Wickman AUTO POINTS

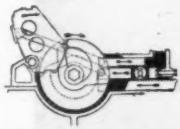
Accurate feed strokes for end-working tools are set by simply sliding the setting-block to the appropriate graduation on the scale attached to the quadrant.
The pentagonal centre-block and two independent slides are actuated by pushers to which the motion of the quadrants is transmitted by racks and pinions, as shown below. Fixed cams, on the same shaft, actuate a fast return and approach motion by means of slides on which the rack pinions are located.



Slides in back position. Pinion carrier about to advance, giving constant approach stroke.



Approach stroke completed. Pinion carrier secured between cams and stop screws.



Working stroke completed.

Wickman Multi-Spindle Automatics embody many notable features. Outstanding is their patented auto-setting mechanism —with NO CAMS TO CHANGE. By its aid, changes from one component to another can be made in a fraction of the usual time and Wickman Automatic production employed economically for *short runs.*

Other advantages these machines possess are: ability to stop spindle indexing and power feeding while setting; extreme accuracy of single point turning; a wide range of attachments and three accelerating positions.

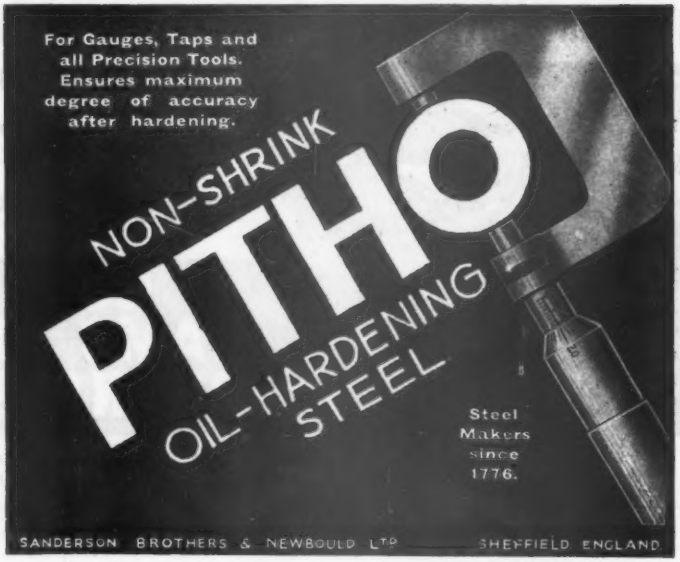
Wickman Multi-Spindle Autos are available in the following sizes: $\frac{7}{8}$", $1\frac{3}{8}$", $1\frac{3}{4}$" and $2\frac{1}{4}$" for bar work; 5" and 6" for chucking work.

Write TODAY for literature showing examples of quick change-over on Wickman Multi-Spindle Automatics.

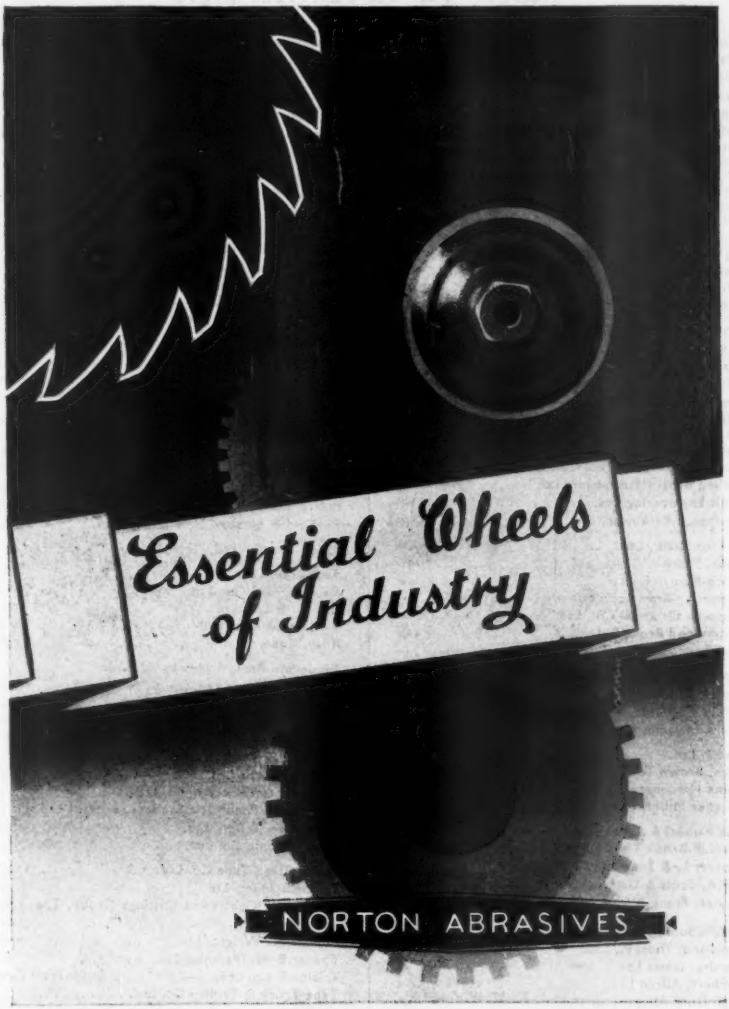
Wickman for Automatics

A. C. WICKMAN LTD · COVENTRY · ENGLAND

LONDON · BRISTOL · BIRMINGHAM · LEEDS · GLASGOW
MANCHESTER · NEWCASTLE · BELFAST


For Gauges, Taps and all Precision Tools. Ensures maximum degree of accuracy after hardening.
NON-SHRINK
PITHO
OIL-HARDENING STEEL
Steel Makers since 1776.
SANDERSON BROTHERS & NEWBOULD LTD
SHEFFIELD ENGLAND

MEMBERS OF THE GAUGE AND TOOL MAKERS' ASSOCIATION



NORTON GRINDING WHEELS

obtainable from

NORTON GRINDING WHEEL CO. LTD.
WELWYN GARDEN CITY, HERTS.

or

ALFRED HERBERT LTD.
COVENTRY

ASSOCIATED COMPANIES IN SIX COUNTRIES

INDEX TO ADVERTISEMENTS

	Page
Acheson Colloids, Ltd.	—
Adam Machine Tool Co., Ltd.	LX
Airmec Laboratories, Ltd.	—
Ajax Machine Tool Co. Ltd.	—
Arnott & Harrison, Ltd.	XLVII
Asquith, Wm. Ltd.	XLVI
Automatic Coil Winder and Electrical Equipment Co., Ltd.	XXXIV
Barber & Colman, Ltd.	VIII
Benton & Stone, Ltd.	—
Birlec, Ltd.	XLI
Birmingham Aluminium Casting (1903) Co. Ltd.	—
Bratby & Hinchliffe, Ltd.	XLII
British Steel Founders' Association	XXI
Burton, Griffiths & Co. Ltd.	XXXV
C.W.C. Equipment Ltd.	LIII
Camerer Cuss & Co.	LVI
Catmur Machine Tool Corporation, Ltd.	XIV
Churchill, Charles & Co., Ltd.	—
Cincinatti Milling Machines, Ltd.	XXV
Climax Rock Drill and Engineering Works, Ltd.	XXVI
Cohen Geo. Sons & Co. Ltd.	VI
Coventry Gauge & Tool Co., Ltd.	XVIII
Craven Bros. (Manchester) Ltd.	—
Croft Engineering Ltd.	LVIII
Crompton Parkinson, Ltd.	LII, LXIII
Dawson Bros., Ltd.	LXI
Dean, Smith & Grace, Ltd.	LVII
Delco-Remy-Hyatt	VII
Desoutter Bros. Ltd.	—
Donovan Electrical Co., Ltd.	LXVI
Drummond Bros., Ltd.	XVII
Duckham, Alexander, & Co., Ltd.	—
Electro Dynamic Construction Co., Ltd.	—
Elliott, B. & Co. Ltd.	—
E.M.B. Co., Ltd.	—
Exors. of James Mills, Ltd.	XXXVII
Fescol, Ltd.	—
Firth, Brown Tools Ltd.	XL
Flame Hardeners Ltd.	—
Fletcher Miller, Ltd.	XVI
Gill, Samuel & Sons (Engineers) Ltd.	XXVIII
Gledhill-Brook Time Recorders Ltd.	XXXVIII
Glover, J., & Sons, Ltd.	—
G.P.A. Tools & Gauges, Ltd.	XXX
Guyles, Frank & Son, Ltd.	*Inside Back Cover*
Harris, John, Tools Ltd.	XXII
Headland, Thos. P., Ltd.	—
Hendry, James Ltd.	—
Herbert, Alfred Ltd.	XLVIII, XLIX
High Duty Alloys, Ltd.	—
Hilger & Watts, Ltd.	XXIII
Holman Bros. Ltd.	*Back Cover*
Hoover, Ltd.	XXXII
Hordern, Mason & Edwards, Ltd.	—
Hughes, F. A. & Co., Ltd.	—
Humphris & Sons Ltd.	LVI
Imperial Smelting Corporation, Ltd.	XXXVI
Johansson, C. E. Ltd.	—
Joyce, C. H., Ltd.	LXVIII
Kealavite Rotary Pumps & Motors, Ltd.	LXV
King, Geo. W. Ltd.	XXXI
Lang, John & Sons, Ltd.	—
Lewis & Tylor, Ltd.	—
Linread, Ltd.	—
Lloyd, Richard Ltd.	XXIX
Lund, John Ltd.	XLV
Marley, W. H. & Co. Ltd.	LVIII
Mercer, Thos., Ltd.	XX
Ministry of Fuel and Power	XLIII
Mollart Engineering Co., Ltd.	L
Moore & Wright (Sheffield) Ltd.	LXX
Morgan, George, Ltd.	—
Motor Gear & Engineering Co., Ltd.	LII
McKechnie Bros. Ltd.	XLIV
Mycalex Co. Ltd., The	LX
Newall, A. P. & Co., Ltd.	XV
Newall Group Sales Ltd.	—
Norton Grinding Wheel Co., Ltd.	LXXI
Parkinson, J. & Son	IV
Parsons Chain Co. Ltd.	—
Perry Barr Metal Co. Ltd.	—
Pitter Gauge & Precision Tool Co. Ltd.	LV
Protolite, Ltd.	LI
Pryor, Edward & Son, Ltd.	LXII
Pultra, Ltd.	—
Punfield & Barstow (Mouldings) Ltd.	XII
Quasi-Arc Co. Ltd., The	—
Randalrak, Ltd.	—
Ratcliffe Tool Co., Ltd.	—
Reavell & Co., Ltd.	LXVII
Remington Rand Ltd.	XI
Riley, Robert, Ltd.	LXIV
Sanderson Bros. & Newbould, Ltd.	LXX
Scottish Aviation Ltd.	—
Sheet Metal Technicians, Ltd.	—
Sheffield Twist Drill & Steel Co., Ltd., The	XXXIII
Smallpeice Ltd.	LXVI
Smart & Brown (Machine Tools) Ltd.	—
Sterling Metals Ltd.	III
Sunbeam Anti-Corrosives, Ltd.	—
Sundstrand Pneumatic Sanders (Britain) Ltd.	—
Swift, Geo. & Son, Ltd.	—
Synchronome Co. Ltd.	L
Talbot-Stead Tube Co. Ltd.	LXVIII
Taylor & Jones, Ltd.	—
Technically Controlled Castings Group, The	LIV
Tecnaphot, Ltd.	LXII
Timbrell & Wright, Ltd.	XXVII
Towler Bros. (Patents) Ltd.	XIX
Triefus & Co. Ltd.	*Inside Front Cover*
Tyne Truck & Trolley Co. Ltd.	—
Unbrako Socket Screw Co., Ltd.	XIII
Universal Tools, Ltd.	LXIV
Vaughan, Edgar & Co., Ltd.	X
Ward, H. W. & Co., Ltd.	V
Ward, Thos. W., Ltd.	XXXIX
Wickman, A. C. Ltd.	IX, LXIX
Williams & James (Engineers) Ltd.	LIV
Wolverhampton Die Casting Co., Ltd.	XXIV
Zinc Alloy Die Casters Association	LIX

Page
LXV
XXXI
—
—
—
XXIX
XLV
LVIII
XX
XLIII
L
LXX
—
LII
XLIV
LX
XV
—
LXXI
IV
—
—
LV
LI
LXII
—
XII
—
—
—
LXVII
XI
LXIV
LXX
—
—
XXXIII
LXVI
—
III
—
—
—
L
LXVIII
—
LIV
LXII
XXVII
XIX
t Cover
—
XIII
LXIV
X
V
XXXIX
LXIX
LIV
XXIV
LIX

CHUCKS FOR MODERN HIGH SPEED DRILLING PRODUCTION

"MARVEL" KEYLESS & "ARCHER" KEYLESS DRILL CHUCKS

are designed and constructed to stand up to modern drilling practice. The external design is robust and serves as an efficient casing to protect the internal mechanism. The jaws are protected from damage by the specially hardened boss or cap. The demand for this perfect chuck increases every year, evidence that the leading engineers appreciate its worth.

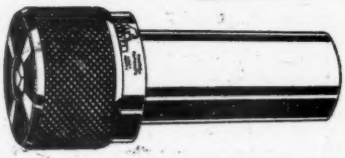
FIVE SIZES FROM ¼in. TO ⅝in.

The "ARCHER KEYLESS DRILL CHUCK

is a correctly designed small size chuck working on the same principle as the "Marvel" which ensures reliable grip and ease of release. It has permanent concentricity and perfect balance for high speed drilling.

TWO SIZES: 0-¼ in., 0-⅝ in.

ASK FOR OUR CHUCK CATALOGUE 5Q



TURRET STYLE "Marvel"

Shanks made solid from body giving short overhang for rigidity and alignment.

Tools quickly changed by hand without disturbing chuck setting.

Made in all capacities and various shank diameters.

FRANK GUYLEE & SON, Ltd.

'ARCHER' TOOL WORKS,
MILLHOUSES · SHEFFIELD, 8

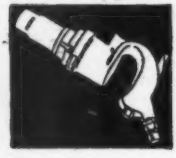
Hard and fast Hitters

The "X" range of

HOLMAN RIVETING HAMMERS

is well known for speed, power and general handiness. The newer and heavier "ER" Hammers are rapidly building a similar name because of their outstanding performance. All models embody the Holman combination of a main valve plus auxiliary valve. This feature not only improves the over-all efficiency of the hammers but it also reduces recoil to a very low order. The throttle enables the operator to regulate the force of the blows to the exact weight required. Outside or inside trigger handles can be supplied as required.

Making the Chips Fly



PNEUMATIC HAMMERS

for chipping and caulking. Fast hitting hammers with a throttle valve giving perfect control from light taps to full force blows. These hammers have many applications and are available in a range of several sizes.

Always in Good Fettle

ROTOGRINDS

These grinders range from a 4 lb. high speed job revving at 16,000 r.p.m. to the Surface Type grinder carrying a 6" wheel. Included in the series is the Loco Rod Type, a special tool with a 9" wide wheel.

Would you like fuller particulars of any of these tools?

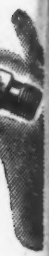
Holman PNEUMATIC TOOLS

THE FIRST NAME FOR LASTING SERVICE

HOLMAN BROS LTD · CAMBORNE · ENGLAND

TSW TP 34

All communications regarding advertisements should be addressed to the Advertising Managers, T. G. Scott & Son, Ltd., Talbot House, 9, Arundel Street, London, W.C.2. Phone: Temple Bar 1942. Printed by Maxwell, Love & Co., Ltd., Bradley's Buildings, White Lion Street, London, N.1.



ERS
r and
cause
lman
e not
duces
gulate
inside

ttle

LS

N D
TP 34
ers,
42.
I.I.